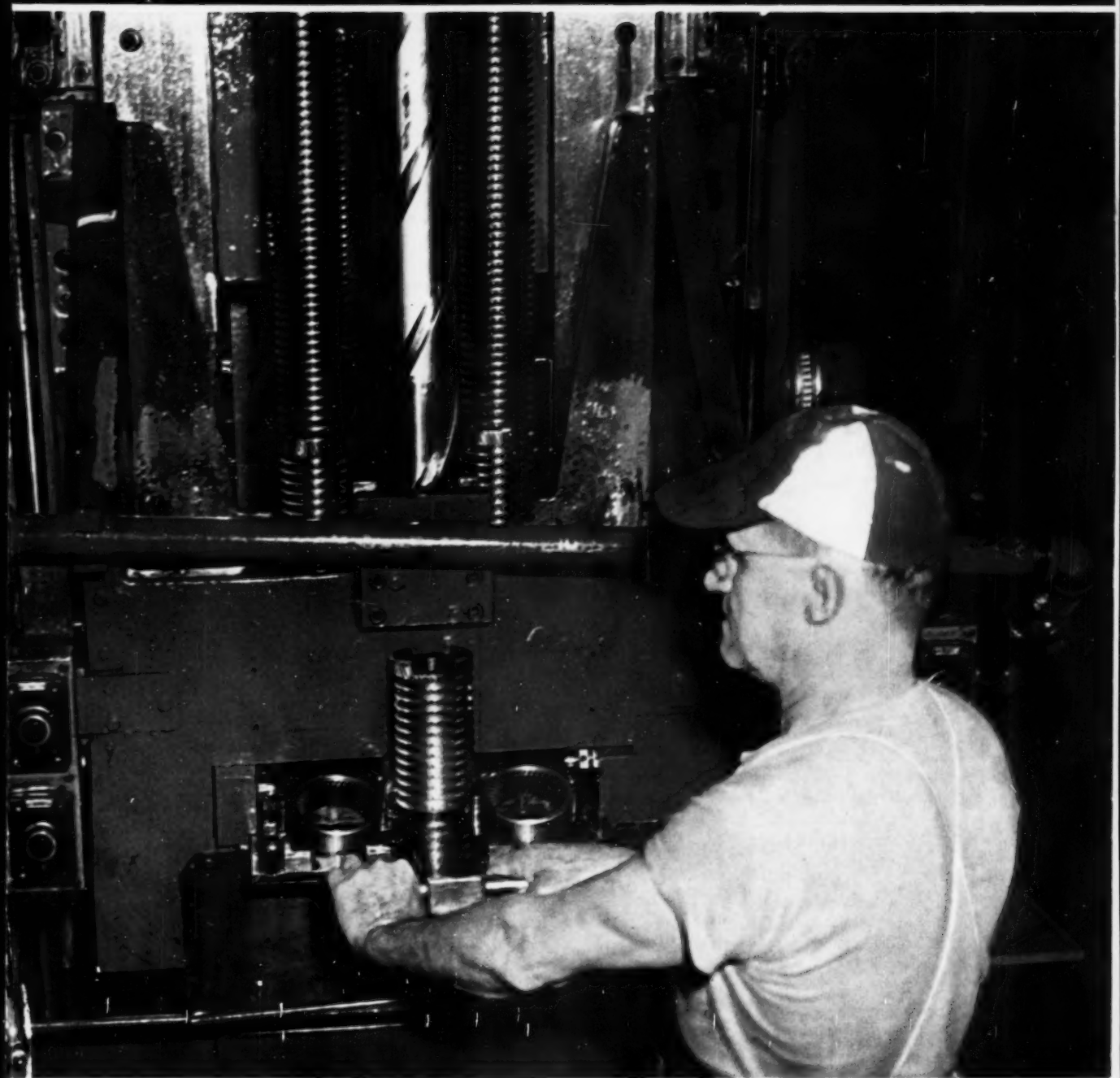
# American Machinist

MAY 18, 1959 75¢

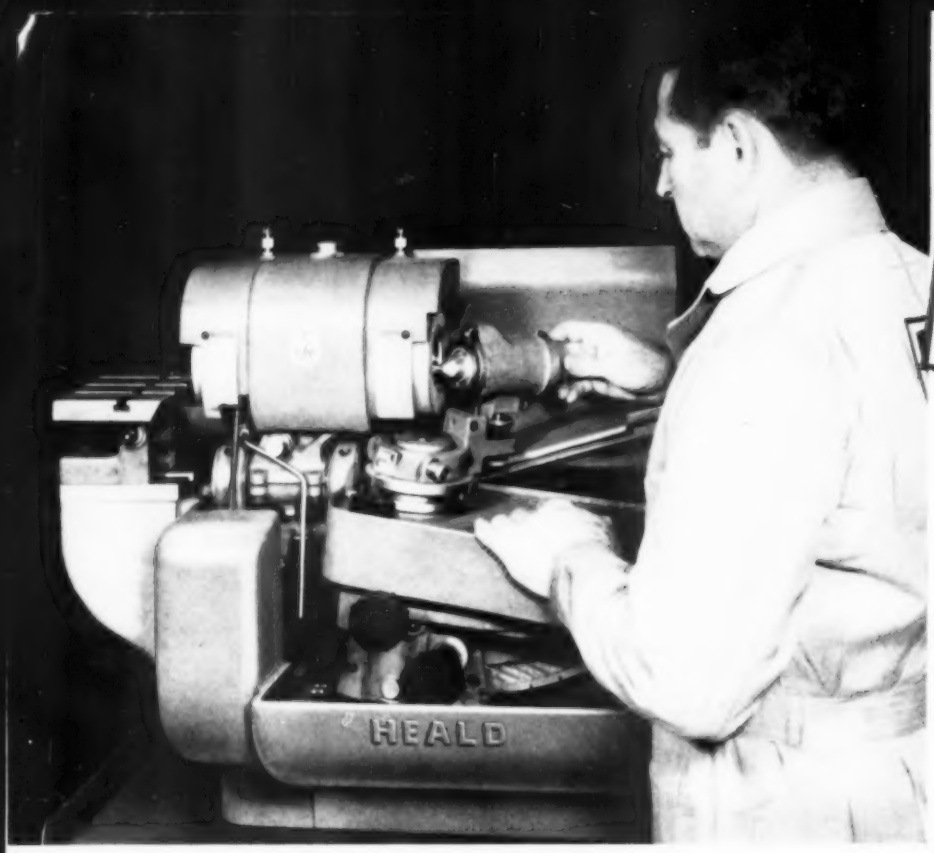

## 10-Year Forecast for Machining

see page 142

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

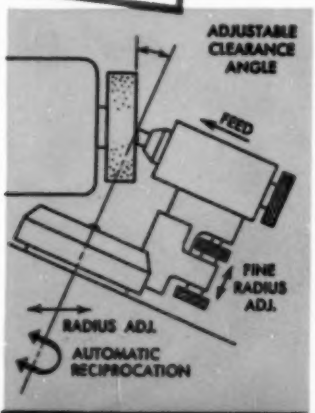


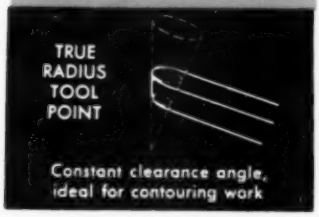
**Internal gears broached to full form in one pass**—see page 120

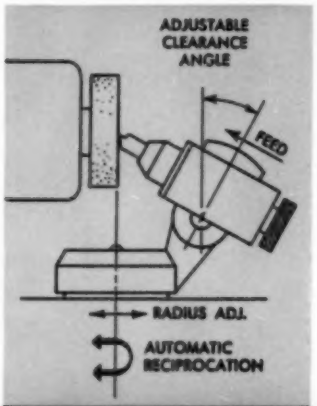


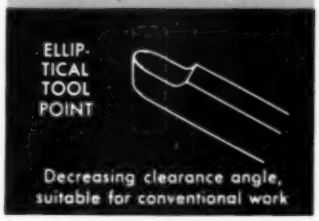

Another **NEW** PRODUCT by Heald

☐ File for Reference
☑ Send for Bulletin




# New Model 4 TOOL SHARPENING MACHINE

## provides highest precision and economy for both **TRUE RADIUS** and **ELLIPTICAL POINT** tool grinding

SETTING new standards of accuracy and economy, the new Heald Model 4 Tool Sharpening Machine is available for both *true-radius* and conventional *elliptical-point* tool grinding. The True Radius arrangement provides a constant tip radius and constant clearance angle, permitting greater accuracy where the point of contact with the tool varies with the configuration of the workpiece, as in contoured shapes. Where such tool geometry is of no advantage, the Model 3 Tool Sharpening Machine, capable of grinding elliptical point tools only, offers desirable savings in initial cost.

With either model, you get *fully automatic tool reciprocation* providing uniform and repetitive tool tip accuracy which permits one operator to tend several machines at the *same time*. An occasional adjustment of the feed knob (as in photo above) is the only operator attention needed. Offhand grinding attachment at left end of machine is standard equipment, furnished at no extra cost.

Remember — in metal cutting, it's the precision of the *tool tip* that guarantees precision results. Ask your Heald representative for complete information on this new Model 4 Tool Sharpening Machine, or send for Bulletin 2-4-3, Issue 1.

*It PAYS to come to Heald*

**THE HEALD MACHINE COMPANY**

Subsidiary of The Cincinnati Milling Machine Co.

**Worcester 6, Massachusetts**

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

American Machinist
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

TRENDS

Metalworking Report . . 2
Spot News . . 99
Washington . . 101
Detroit . . 103
Aircraft and Missiles . . 105
Machine Tools . . 107
Materials . . 109
What's Ahead . . 111
Field Report . . 208

Departments...

Letters . . 92
Calendar . . 95
Editorial . . 115
Talking Shop . . 161
Memos . . 161
Practical Ideas . . 162
New Equipment . . 165
Names . . 243
New Books . . 248

## contents for May 18, 1959

VOLUME 103, NO. 10

**Hot drilling of uranium . . .** Heated above 900 F, uranium becomes relatively easy to drill. *By E J Lach and Randall Lenz, Argonne National Laboratory* . . **117**

**Dies get flexible facings . . .** A new Versamid-based epoxy reduces the cost of capping drop-hammer dies. *By James Bock, Grumman Aircraft Engineering Corp.* . . . . . **119**

**Full-form finishing . . .** Internal gears are rough and finish broached in one pass with new combination tool. . . . . **120**

**Wage-price spiral perils U S in world metalworking market . . . . . 122**

**The case for natural diamonds . . .** Reports from Diamond Research Laboratory claim efficiency of "new" natural grit will be up to 40% higher than the conventional natural grit. . . . . **124**

**Air + Electronics + Hydraulics position parts to ± 0.0005 in. . . 126**

**Zirconium welds join parts for atomic power plant . . .** Properly controlled and sequenced fusion welding is key to successful fabrication. *By J Glatter, E G Schwartz, W L Frankhouser, and J H Eyler, Westinghouse Electric Corp.* . . . . . **128**

**Decisions or devices? . . .** Experts, computers, formulas are tools. But you still have to make your own decisions. . . . . **131**

**Smart tooling eases a machine builder into airframe fabrication . . .** Convert a planer into a skin mill and start to diversify. *By C M Thien, Ekstrom, Carlson & Co.* . . . . . **132**

**The hardening foreman cures tool troubles . . .** Answers to questions you'll frequently hear on tool hardening. *By Charles Doescher* . . . . . **134**

**Electrophoresis—a new coating tool . . .** Almost anything can be bonded to almost anything. *By R A Keeler and L C Terminello, Vitro Laboratories* . . . . . **138**

**Shop Shots . . .** Five examples of ingenuity in reclaiming valves, machining sleeves, positioning strip, contouring honeycomb, and locating drills. . . . . **140**

**Looking 10 years ahead in machining . . .** Predictions based on past performance can be plotted on logarithmic charts. *By M Eugene Merchant, The Cincinnati Milling Machine Co.* . . . . . **142**

**Simplified method teaches sketching for everyone . . .** Engineers who want to sketch, but can't, will find this new technique a real aid. *By Jerome J Foley, Jr.* . . . . . **147**

REFERENCE BOOK SHEETS

**Permanent-mold aluminum castings, I, II . . .** Properties, comparative costs, and design hints. *By Peter Noy, Canadian General Electric Co.* . . . . . **155**

**Application of carbide reamers . . .** Rules for getting good results, plus data on coolants, speeds, and feeds. *By Carl Neiderfringer, The Atrax Co.* . . **159**

TURN PAGE FOR METALWORKING REPORT →

# METALWORKING REPORT

## SIGNIFICANT CURRENT DEVELOPMENTS IN TOOLING AND PRODUCTION PROCESSES

### CUTTING

#### Jet Machining

Can an extremely high velocity jet of fluid be used to knife through metal? It is known that raindrops seriously erode metal surfaces on planes and missiles at hypersonic speeds. Other tests (by Bowden and Brunton) demonstrate that firing slugs of water at 3500 fps against stainless steel will form pits

Conjecturing on the possibilities of the technique, M Eugene Merchant says that abrasive might be introduced into the jet after it left the orifice, further expediting the rate of metal removal. This technique might be the basis for a new machining process. For other forecasts by Dr Merchant, see page 142.

#### Throwaways for Heavy Castings

Double cutting-tool life is reported by Baldwin-Lima-Hamilton at a 20-ft vertical boring machine where huge stainless-steel castings are machined. Throwaway carbides (Kennametal grade K6) were applied in a four-bit indexing toolholder to cut through heavy surface scale and softer core metal. Change was from HSS and brazed-carbide tools, which lasted 30 min in the scale and 60 min inside. New life is 1 hr in the scale areas and up to 3 hr inside. Speed was upped from 80 to 150 sfpm, and feed reduced from 0.03 to 0.015 ipr. Improved life was because brazed joints were replaced with clamped assembly, which reduced effects of vibration as tools passed through scale.

#### Low-cost Machines

Machine tools tend to get bigger, heavier, more powerful, more rigid. For many applications this is what users want. But for some applications a lighter, lower-powered machine is satisfactory (*AM*–May 4 '59, p77). There are an increasing number of machines being introduced to meet this demand. Three of them are described in this issue on pages 166 and 167—a broach, a drill, and a belt grinder. Among earlier entrants was a universal grinder (*AM*—Jan 12 '59, p139).

#### Cheaper Low-Production Blanks

Many shops, even the larger appliance plants, must cut a variety of blanks in relatively small quantities. Tool cost and set-up time are generally viewed as excessive by most managements.

To save die cost for low-production blanking of light-gage materials, an Australian tool engineer has designed a universal die set. Relatively cheap punch and die members are interchangeably mounted in the die set in minimum changeover time.

The tool allows sheets up to 36 in. wide to be passed between the guide posts. Blanks up to 24 x 12 in. can be cut.

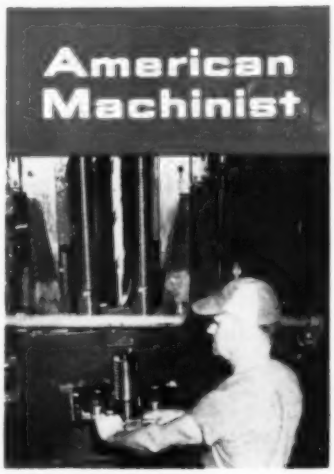
Top and bottom shoes have identical patterns for drilled holes for shoulder screws and tapped holes for fastening punches and dies. Locating keys, set into grooves in the front and left-hand edges of the shoes, align the cutting members.

The lower shoe has a cushion plate with a pattern of tapped holes for stripper screws that align with the drilled holes in the shoe. Above the upper shoe there is a knockout plate with a pattern of tapped holes for ejector screws that ride in the drilled holes in the shoe.

The universal die set has been designed to take compound dies, a simple blanking die, a progressive blanking set up, and even several blanking punches.

### *CAUTION*

*These pages are not a synopsis of this issue of American Machinist. Major articles are described briefly in the Contents page. Because the Trends pages are classified by subject, they are not described anywhere else. Most of the developments in this department are so new that further information is not yet available —when it is, you will find a page reference to the article.*




**COVER:**

*Precision internal gears are broached to full finished form in one pass at Warner Gear Div, Borg Warner Corp. A short shell that contains the finishing teeth is added to a roughing broach to do the job. Warner worked out the tooling idea with National Broach & Machine Co, see page 120.*

### FORMING

#### Electronic Strip Shear

An under-drive cut-off press can be used by warehouses and metal fabricators to cut strip stock to length. Flexibility is obtained by electronic control that makes changing the length of cut instantaneous.

On cold-rolled strip the McKaymatic die shear line will yield sheets within re-squaring tolerances if normal camber conditions are present. High quantities of mixed lengths can be made without tedious delays for changing the length of cut. When length and quantity commands are changed, either manually or automatically, the line reacts without the necessity of slowing down or stopping.

The surface measurement system, as developed by the McKay Machine Co, Youngstown, Ohio, includes a pulse generator on the exit pinch rolls. An electronic counter controls length of cut. Operator "reads in" length of cut command by pushbuttons, but automatic programming by punched tape or manually preset selectors may be had.

## HEAT TREATING

### Spheroidized Heading Stock

A modern 102-ft-long continuous furnace turns out uniformly spheroidized heading stock at rates up to 21 tons per 8-hr shift, at a new installation at Chicago Screw Co. Built by Surface Combustion, the furnace handles coils up to 900 lb and 54 in. in diameter, and turns out a treated stock that shows better than 85% spheroidization of pearlite in such materials as SAE 1038, 1041 and several low-alloy steels.

Radiant-tube heating provides uniform heating and, at the same time, minimizes scale formation. This, in turn, permits faster pickling and cuts product weight loss. This same furnace can be used for carbonitriding, carbon recovery and normalizing.

### Hardening Long, Thin Dies

Long, thin, stamping dies made of water-hardening steel often warp during a hardening quench. If streams of water are played simultaneously on both faces of the die, the tendency to warp in either direction will be minimized. Other practical tips on how to harden tools can be found in the article beginning on page 134.

## INSPECTION

### Visual Grain Size Check

Grain size must be kept within specific limits in the manufacture of blades and vanes for jet engines. Maximum strength and minimum brittleness are found in the shaped and heat-treated parts when grain size is less than 1/32 in.

Obviously, grain size of 1/32 in. and above can be observed readily with the eye, if the smooth surface is removed. An etchant is indicated. Originally, the Air Force laid down etching specifications based on the use of ferric chloride. Later it was discovered that a mixture of hydrogen peroxide and hydrochloric acid will do the job better.

At Curtiss-Wright's Metals Processing Division in Buffalo, formulations now used are:

For etching blades—a solution containing 209 oz of HCL and 30 oz of 35% hydrogen peroxide made by Becco Chemical Div., Food Machinery & Chemical Corp, Buffalo. Every 4 min. the bath is reactivated with 15 oz of hydrogen peroxide. Blades are immersed for 3, 10, or 15 min., depending on blade material.

For etching nozzle buckets—a solution consisting of 421 oz of HCL and 34 oz of 35% hydrogen peroxide. This solution is reactivated at 5 min. intervals with 17 oz of hydrogen peroxide. Immersion time—30 to 60 sec. After the final inspection is completed, the blades or vanes are buffed and polished.

### Optics Check Radar Antennas

Special angle measuring facilities have been built at the Raytheon Mfg Co., plant in Maynard, Mass to test radar antennas. Various angles that must be interpolated in the test procedures are checked with Gurley coincidence reading systems. One of these, a Unisec, is placed on top of the antenna structure to indicate azimuth and has a jig transit for alignment. The other system is placed vertically and is aligned with a prismatic level.

The Unisec is a device that in one size will read a circle 5 in. in dia to one second of arc directly. For many years it has been recognized that "if two sides of a circle are read, eccentric errors are eliminated." The Unisec operates on this principle, and is therefore able to reduce long-distance alignment problems to a fraction of the error normally achieved.

## WELDING

### Diffusion Bonding

Titanium, Zircaloy, and Zircaloy-stainless joints have all been made successfully by vacuum diffusion bonding. The process is similar to brazing, but the main principle is that, under heat and pressure, atoms will migrate across the interface and form a solid bond, often without filler metal.

Earl J Clark of General Electric Co reported to the Welding Society's Annual Meeting that the process produces much stronger joints in titanium than vacuum brazing does. Parts with positive metal-to-metal fitup were processed in one hour to produce joints as strong as the base metal. When fitup ranges from 0.000 to 0.002 in., a fine silver filler is required.

Excellent joints are made in Zircaloy-2 by diffusion bonding with a diffuser element between the faying surfaces. However, William Feduska of Westinghouse Electric Corp states that this procedure should be employed only as an alternate, when joints are so inaccessible or so complex that welding will not serve.

Strong, corrosion-resistant joints between Zircaloy and stainless—almost impossible by other methods—have been made in ⅞-in. tubing at Knolls Atomic Power Laboratory (operated by GE for the AEC). G M Gerken of Knolls will report on this work in our next issue.

## ASSEMBLY

### Microscopic Assembly

Jewelers' loupes are on the way out, at least at the factory. New small watch sizes have forced Elgin National Watch Co to install Gaertner microscopes at assembly benches. The instruments invert images so operators see the watch parts right side up, and some include scribed reticles that indicate weld patterns and component spacing.

### Building Fronts are Prefabs

Fancy new fronts for office buildings and stores are now prefabricated in stainless steel at building-supply plants, then assembled by bolting together major units at the site. Metal frameworks for doors, windows, and whole fronts that include both are getting to be a large enough business that many architectural shapes are now standard stock items. Republic Steel reports that there are four standard stainless mullions (vertical members). Assemblies are cut and fitted at the plant to match field measurements, then torn down, shipped, and reassembled at the building.

## FINISHING

### Ultra-fine Powders

Currently under development at Vitro Laboratories, West Orange, NJ, is a process for producing ultra-fine metal powders by use of a high-intensity electric arc. Powders so pro-

## THE OUTLOOK

*Despite an upswing in sales and production in recent months, metalworking's basic supplier and service industries (foundry, heat-treating, stampings, general job shops) are finding that profit margins are squeezed by increased cost of labor and materials.* *See p111.*

duced are intended primarily for electrophoretic deposition and electro-osmosis (p138), but offer some interesting possibilities in other powder-metal fields. By this process it is possible to obtain metal particles less than one micron in size and in types not commercially available. Conventional ball milling necessarily produces some contamination from the material used in the balls themselves, but this is avoided by the arc process.

## MATERIALS HANDLING

### Stain-Free Handling

A tough, heat-sealable plastic, specially treated to inhibit rust, Nox-Rust Clear-Pak promises to solve many problems connected with the packaging and handling of small precision parts. Steel and iron parts protected by the plastic are readily visible, retain their brightness indefinitely, and cannot be soiled during handling.

A development of the Daubert Chemical Co, the plastic sheet is a high-strength polyester (Mylar) film coated on one side with a special composition that contain volatile corrosion inhibitors. At the same time, the coating makes possible sealing of the hard-to-heat-seal plastic.

The new material has the advantage over treated-paper packaging of being transparent, permitting ready identification of parts. It will also withstand rugged handling. Tensile strength is 14,000 psi, and elongation before tearing is 75%.

## MATERIAL AND COMPONENTS

### Foamed Silicon Carbide

Developed out of research at Carborundum, silicon-carbide foam possesses a variety of important characteristics. First, it is lightweight (approximately 16 to 18 lbs per cu ft for the low-density form and 30 to 35 lbs per cu ft for the high-density form) and, second, it has high porosity and very low thermal conductivity for a silicon carbide body—about 5 BTU/in./sq ft/hr/F at 800 F for the low-density form.

Physical strength varies between the high and low density forms, with the former capable of supporting loads of about 800 psi. Preliminary studies indicate that this cellular form of silicon carbide overcomes some of the mechanical shock problems commonly experienced with most hard refractory bodies.

One of the unique advantages of this foam is its ability to be machined with conventional steel cutting tools. Intricate shapes can be produced to close tolerances. Expected uses include products requiring light weight, corrosion resistance, high porosity, and thermal insulation up to 4000 F.

### New Spherical Roller Bearings

Three major design improvements have been combined to produce what is said to be the highest capacity spherical roller bearing yet developed Link-Belt Co, in describing these bearings, says they include: maximum diameter and quantity of convex rollers for each bearing size; precision - machined, centrifugally cast bronze retainers, and high, heavy inner-race shoulders. All components are in optimum balance to assure long bearing performance on the most severe installations. Initially, these bearings will be supplied in series 22200 and 22300, in bore sizes ranging from 1.5748 in. to 11.0236 in. with dynamic load ratings up to 288,000 lbs. Bearings also will be available in pillow blocks in bore sizes ranging from 1-7/16 to 10 in.

## MANUFACTURING CONTROL

### Cutting Maintenance Costs

What's the best way to reduce maintenance costs? George C Bonnell, speaking recently at the Vickers Hydraulic Conference, has formulated a simple, down-to-earth plan that, carried out properly, would solve many a plant's cost-of-maintenance problems. Although Mr Bonnell (who is Service Manager of the Vickers Machinery Hydraulics Div) is primarily concerned with hydraulics, his formula is much more universal. Here are the highlights:

1. Train your eyes, ears, and sense of touch to recognize signs and symptoms of possible hydraulic trouble. 2. Be sure hydraulic repairmen know these signs. 3. Provide written instructions for machine operators on how to recognize them. 4. Recruit as many people as possible to campaign for reduced maintenance costs. 5. See to it that all reports of potential trouble are acted upon immediately.

ALBERT HAUPTLI publisher

BURNHAM FINNEY editor

ANDERSON ASHBURN managing editor

RUPERT LE GRAND senior associate editor
WM M STOCKER, JR senior associate editor
BEN BROSHEER (Chicago) associate editor
H E LINSLEY associate editor
CHARLES D EMERSON associate editor
GEORGE H DE GROAT Detroit editor
TOM JOHNSON associate editor

ANN McTAGUE assistant editor
GOSTA WERNBERG assistant editor
RICHARD T BERG assistant editor
JOHN J DWYER, JR assistant editor
ARTHUR J ROTH assistant editor

JOSEPH S POZNANSKI art director
MATTHEW T HAGGERTY assistant art director
ROSEMARIE KELLY makeup

ROBERT SHEETS news editor
MORTON REICHEK Washington
DONALD LOOMIS Washington
DONALD MacDONALD Detroit
WILLIAM G MELDRUM Cleveland
STEWART RAMSEY Chicago
MARGARET RALSTON San Francisco
JOHN KEARNEY Los Angeles
MICHAEL J MURPHY Los Angeles
RAY BLOOMBERG Seattle
B E BARNES Atlanta
KEMP ANDERSON, JR Dallas
WILLIAM J COUGHLIN London
ROBERT GIBSON Moscow
ROBERT E FARRELL Paris
PETER WEAVER Mexico City
MORRIE HELITZER Bonn
SOL SANDERS Tokyo
DOUGLAS GREENWALD statistician
M K MATULIS assistant statistician

DEXTER KEEZER director economics dept
GEORGE B BRYANT, JR chief Washington Bureau
JOHN WILHELM manager world news
FRED H COLVIN editor emeritus

GEORGE REPPERT, JR advertising sales manager
P F PRITCHARD manager, market research
JAMES J HOGAN business manager
ROBERT C MATTOON circulation manager
RAN SCLATER promotion manager
CATHERINE C KANE manager, reader service

*American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index. American Machinist publishes its own annual index; this is available on request to the editor.*

**American Machinist**, published bi-weekly, with an additional issue in mid-September, by McGraw-Hill Publishing Company, Inc. James H. McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, CIRCULATION, ADVERTISING and PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd St, New York 36, NY. Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary; officers of the Publications Division: Nelson Bond, President; Harry L. Waddell, Senior Vice President; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator.

Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.

Postmaster: Please send form 3579 to American Machinist, 330 West 42nd St, New York 36, NY

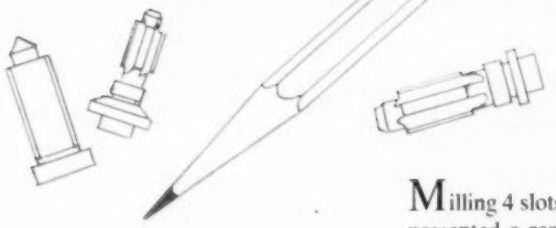
United States subscription rate for individuals in the field of the publication $5.00 per year, single copies 25 cents. Canada $7.00 per year, foreign $25.00 per year, payable in advance. Second-class postage paid at New York, NY. Printed in USA. Title registered in U.S. Patent office.

©Copyright 1959 McGraw-Hill Publishing Co. Inc. all rights reserved.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Fulfillment Manager, American Machinist, 330 West 42nd St, New York 36, NY. Subscribers should notify Fulfillment Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

# CINCINNATI O-8

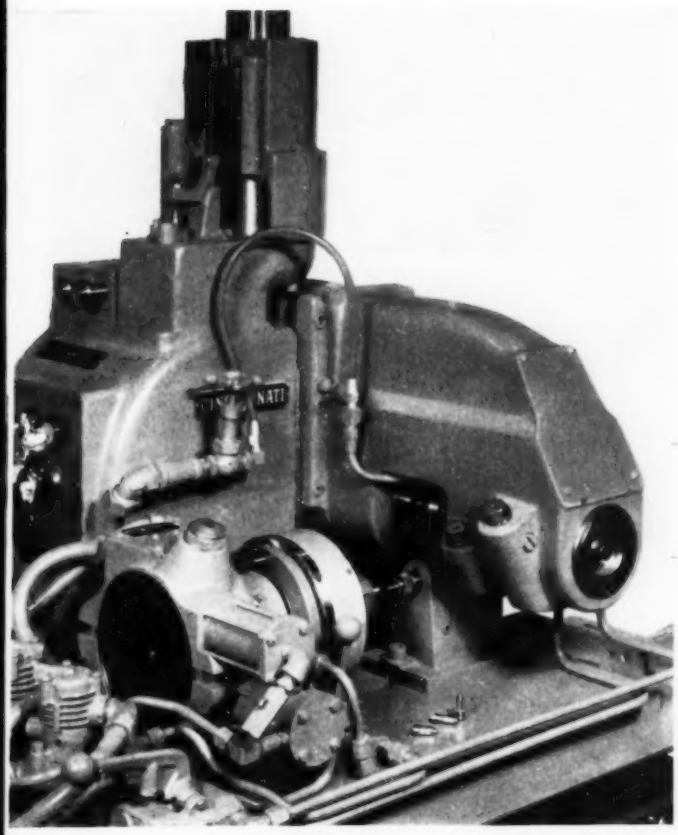
## uses DUPLEX HEAD and AUTOMATIC INDEXING



## for High Production of SMALL PARTS

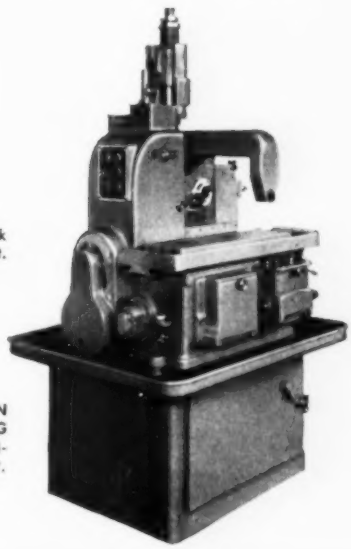
Milling 4 slots or flats 90° apart on small valve parts presented a real challenge in cost reduction. Cincinnati Engineering Specialists tooled up a CINCINNATI 0-8 Automatic Rise and Fall Milling Machine, whose basic equipment already performs much of the operator's work . . . automatic table and spindle carrier cycles with quickly interchangeable cycle selectors. To these standard features were added a duplex head, to mill two surfaces simultaneously; and air-operated indexing fixture, to perform two milling operations in one cycle without work handling. The result: **4 surfaces milled automatically in one continuous cycle, at a production rate of 139 to 150 per hour.**

Are rising costs putting the squeeze on *your* profits? Cincinnati Engineering Specialists are experts in solving such problems with the aid of modern methods and new machines, such as CINCINNATI 000-4, 1-18 Automatics, the 0-8 described here, and the HyPowermatics discussed on the following pages. Send us your blueprints and data on problem components. Write today. **Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**



**TWO OPERATIONS** are performed in one cycle on this CINCINNATI 0-8 Plain Rise and Fall Milling Machine, automatically milling 4 surfaces on small valves. Special tooling includes duplex head and air-operated indexing fixture.

Automatic cycle for work performed on machine at left.



**CINCINNATI No. 0-8 PLAIN RISE AND FALL MILLING MACHINE.** Complete specifications in catalog M-1607-2.

KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES
• CUTTER AND TOOL GRINDERS • ELECTRICAL DISCHARGE MACHINES

**CINCINNATI®**
MILLING MACHINE DIVISION

# HyPowermatic *plus*

**TWO AUTOMATIC INDEXING FIXTURES,** mounted on the table of a CINCINNATI HyPowermatic, for automatically milling three slots in each side of clutch housings. Standard feature-advantages include Hydra-mech table drive with automatic backlash eliminator, infinitely variable feed rates ¼ to 150 ipm, two-way automatic table cycles, automatic spindle stop and others.

**CINCINNATI NO. 310-183 PLAIN HyPOWERMATIC MILLING**
**Illustrated at right with tooling for the job described here.**
**The complete HyPowermatic line includes:**

| | Table Traverse | hp |
|---|---|---|
| 42 sizes Plain | 36" to 168" | 7½ to 50 |
| 42 sizes Duplex | 36" to 168" | 7½ to 50 /spindle |
| 42 sizes Plain Tracer Controlled | 36" to 168" | 7½ to 30 |
| 42 sizes Duplex Tracer Controlled | 36" to 168" | 7½ to 30 /spindle |

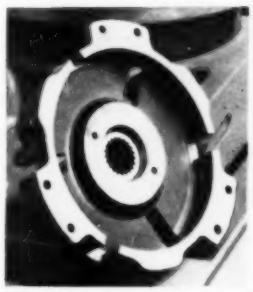
Write for catalog No. M-1909-2.

BUILDERS OF FINE MACHINE TOOLS: KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES •

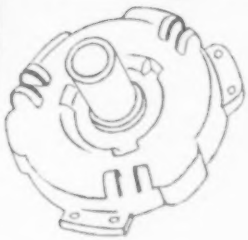
**THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO**

CIRCLE 173 READER SERVICE CARD

# INGENIOUS TOOLING



## solves Cost Problem in milling BOTH SIDES of Clutch Housings

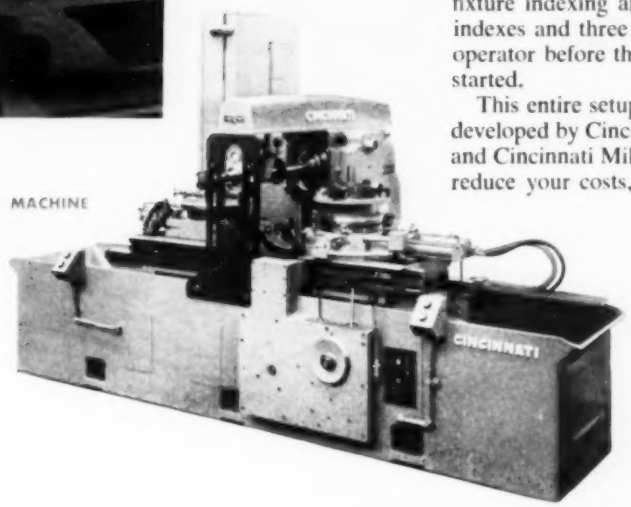


Milling operations on both sides of a part can be quite a problem. For production work the obvious procedures are unsatisfactory—two machines each performing one operation, or two setups in sequence on one machine. Cincinnati Milling Specialists devised a much lower cost method, and combined it with the unique advantages inherent in CINCINNATI HyPowermatic Milling Machines.

> Three slots are automatically milled in each side of clutch housings, using two fixtures and transferring the part from one to another . . . the fixture in the foreground for slots through the lugs, and the one in the background for slots through the flange on the opposite side. Loading and unloading are easily accomplished during the time required for the automatic milling cycles. Production: 24 per hour at 80% efficiency, milled both sides.

Details of the automatic cycle are interesting. Table traverse and fixture indexing are automatic with the table stopping after three indexes and three cuts. This is a safety feature which protects the operator before the automatic cycle at the other end of the table is started.

This entire setup is typical of ingenious cost-reducing equipment developed by Cincinnati Engineering Service Specialists. These men and Cincinnati Milling's wide variety of standard machine tools can reduce your costs, too. May we hear from you?




MACHINE

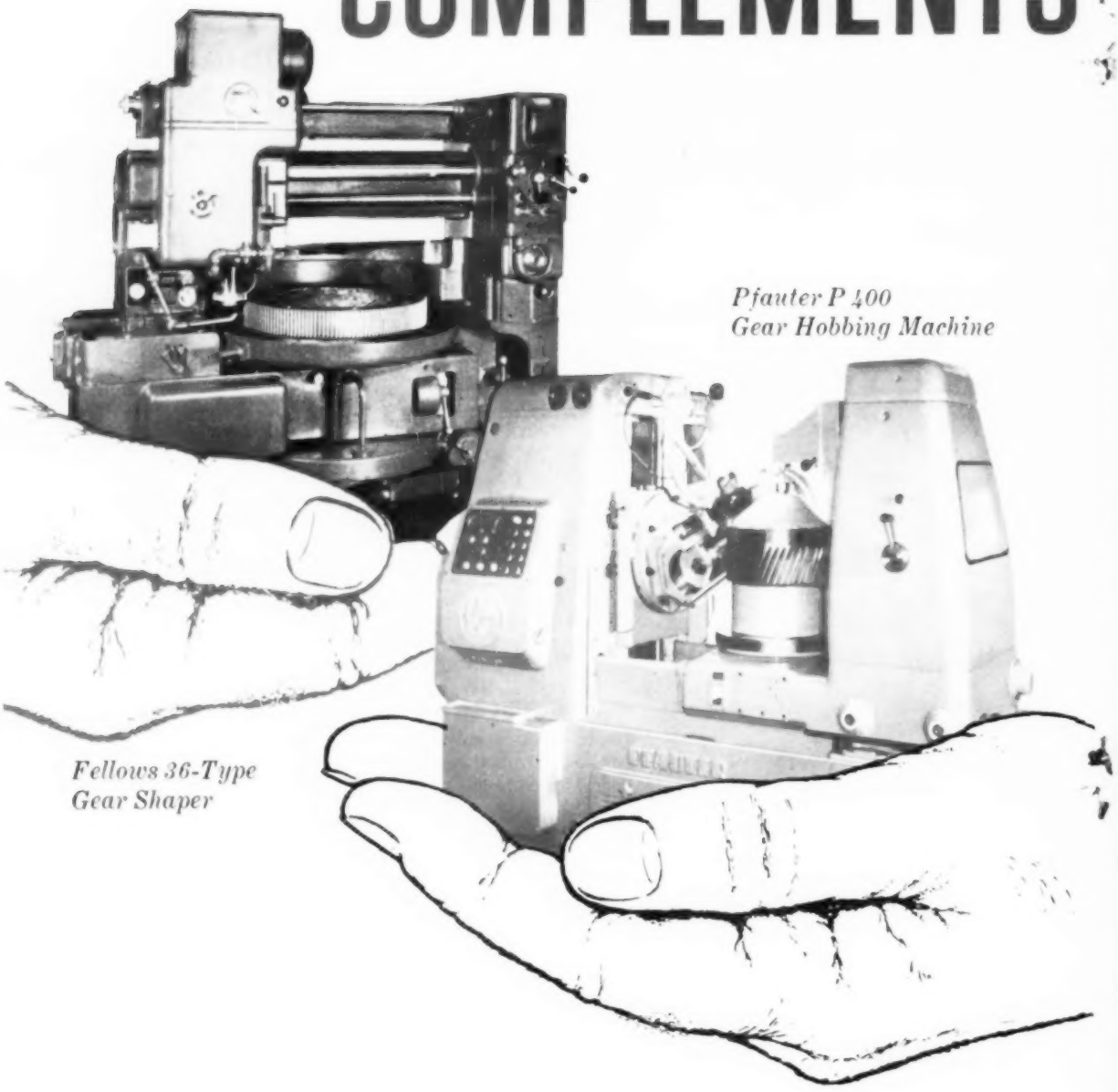
CINCINNATI

CUTTER AND TOOL GRINDERS • ELECTRICAL DISCHARGE MACHINES

**CINCINNATI®**
**MILLING MACHINE DIVISION**

CIRCLE 174 READER SERVICE CARD

# PERFECT COMPLEMENTS



*Pfauter P 400*
*Gear Hobbing Machine*

*Fellows 36-Type*
*Gear Shaper*

THE
PRECISION
LINE

# . . . ✓ FELLOWS GEAR SHAPERS!
# ✓ PFAUTER GEAR HOBBERS!

**Now Fellows sells, and later will manufacture, the world-famous Pfauter Gear Hobbing Machines and Worm Milling Machines.**

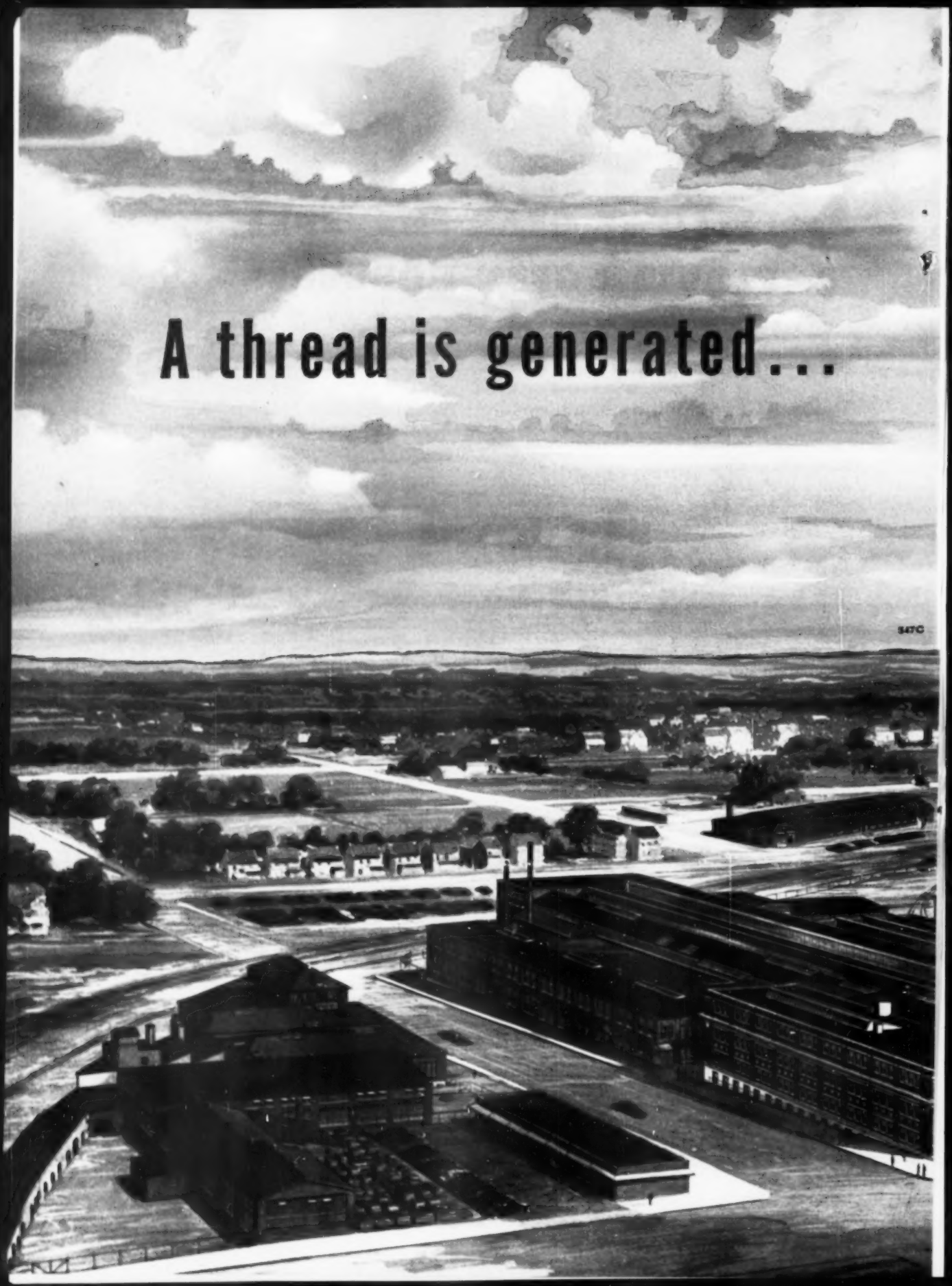
Fellows Gear Shapers and Pfauter Gear Hobbers provide complete coverage of modern gear production equipment needs. Both operate on the molding-generating principle. The Pfauter Hobbers embody every important advance in hobbing technique, in most cases originated by Pfauter. And Fellows Gear Shapers incorporate every major advance in gear production by the Gear Shaper method originated by Fellows.

Among the many features incorporated in Pfauter Hobbers are the differential for helical gear hobbing, the hydraulic backlash eliminator for efficient climb hobbing, the fully automatic plunge for longitudinal and radial-tangential hobbing and, most recently, exclusive Pfauter DIAGONal Hobbing. Capacities of Pfauter machines range from 3" max. P. D., $2\frac{3}{4}$" max. face width, to 120" max. P. D., $1\frac{1}{4}$ D. P. and 30" max. face width.

With the addition of the Pfauter line, Fellows provides the most comprehensive service possible in the field of gear production equipment. Your Fellows representative can give you full information about our machines and instruments which cover every phase of gear production.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Avenue, Royal Oak, Mich.
150 West Pleasant Avenue, Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Avenue, Los Angeles 45

*Fellows* *Gear Production Equipment*


A thread is generated...
547C

*every minute of each day--somewhere throughout the world, with a product of this plant--the world's largest, in terms of employment, product value, and completeness of line, devoted exclusively to the manufacture of thread generating equipment.*

**LANDIS *Machine* COMPANY**

WAYNESBORO · PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

Threading Machines

Die Heads—
Rotary & Stationary

Taps—Collapsible
& Solid Adjustable

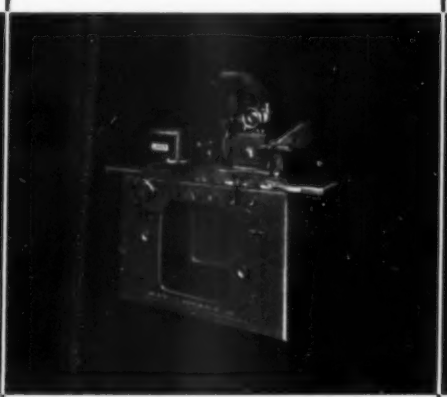
Centerless Thread
Grinding Machines

Thread Rolling Dies

Thread Rolling Machines

# Why Landis grinders with Microsphere

exclusive Microsphere spindle bearing

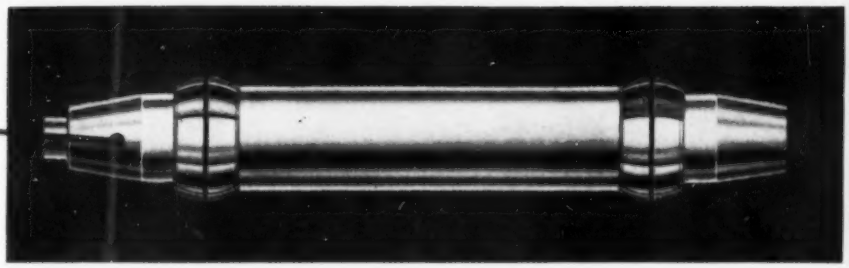
| plain grinders | universal grinders | centerless grinders |
|---|---|---|
| |  | |
| *4" to 36" swing*<br>*18" to 240" between centers*<br>*3 to 30 hp wheel drive* | *10" to 48" swing*<br>*28" to 120" between centers*<br>*1½ to 7½ hp wheel drive* | *1/16" to 6" work diameter*<br>*15 to 25 hp wheel drive* |

# LANDIS

precision grinders

# bearings give precision *plus* production

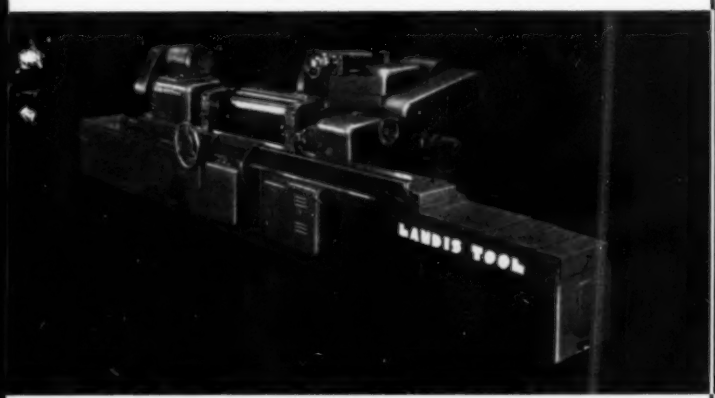
exclusive rigidized
wheel spindle



**Here's why Microsphere bearings *and* rigidized spindle give precision *plus* production.**

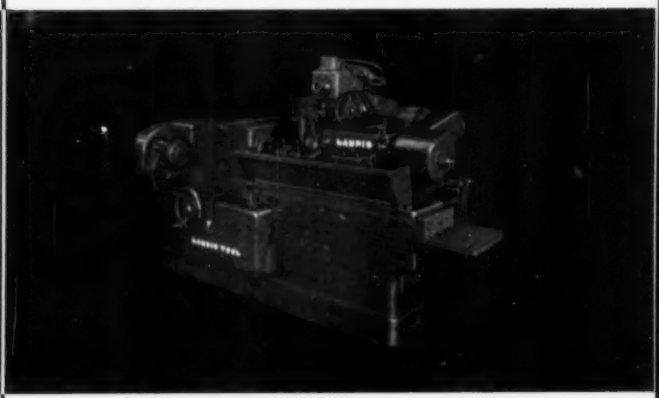
- heavy cuts to close tolerances because of bearing and spindle rigidity
- closest running clearance gives fine finishes and quick positive sparkout
- trouble-free operation with one-piece bearings and simplified construction

## roll grinders




*10" to 60" swing*
*48" to 288" between centers*
*5 to 40 hp wheel drive*

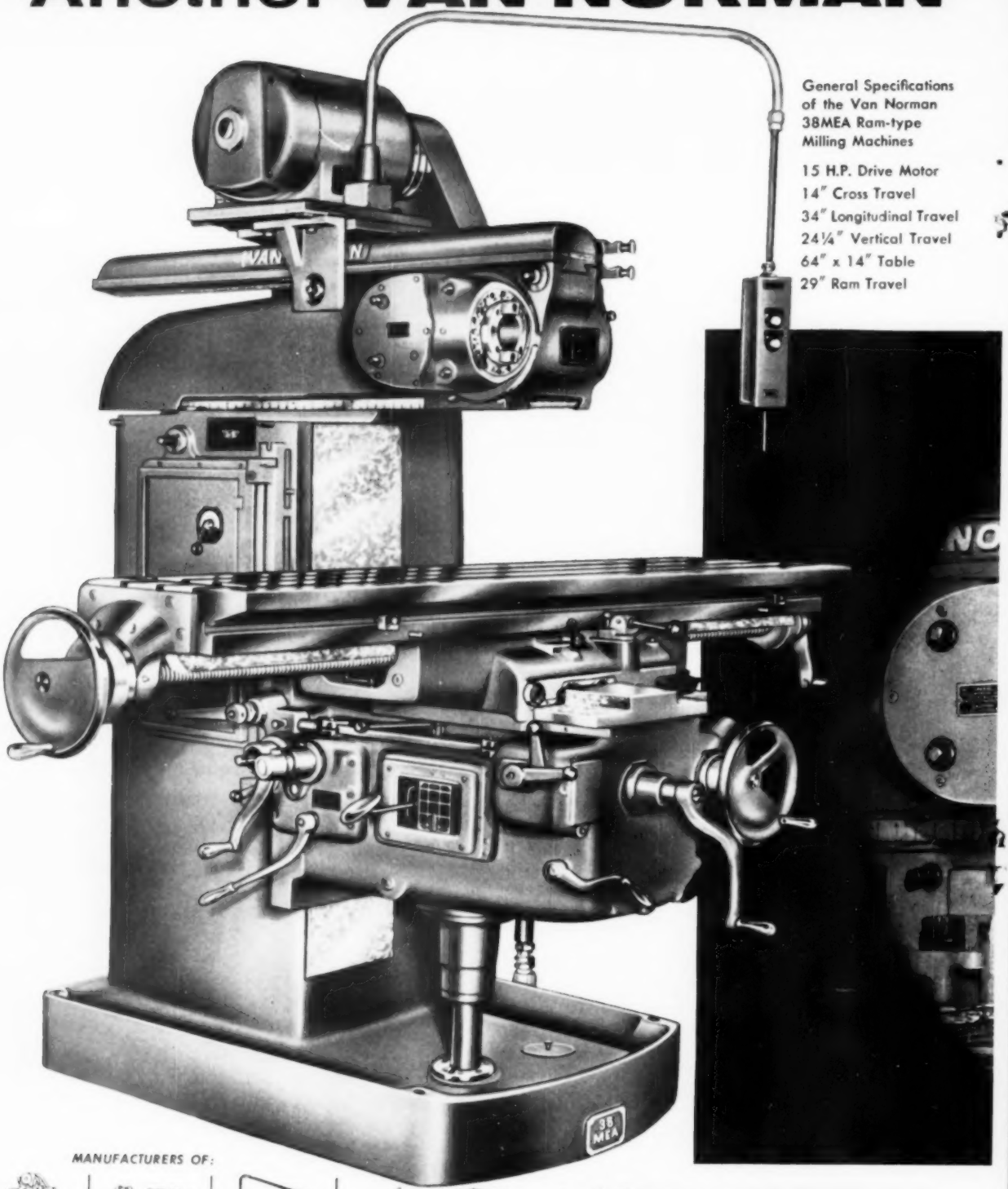
## special purpose grinders



multiple wheel, concentric,
automotive types:
crank, cam, piston, valve

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

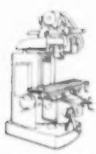
# Another VAN NORMAN



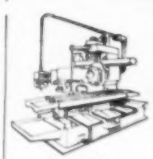
General Specifications
of the Van Norman
38MEA Ram-type
Milling Machines

15 H.P. Drive Motor
14" Cross Travel
34" Longitudinal Travel
24¼" Vertical Travel
64" x 14" Table
29" Ram Travel

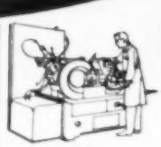
MANUFACTURERS OF:


Milling Machines

Standard Cylindrical Grinders

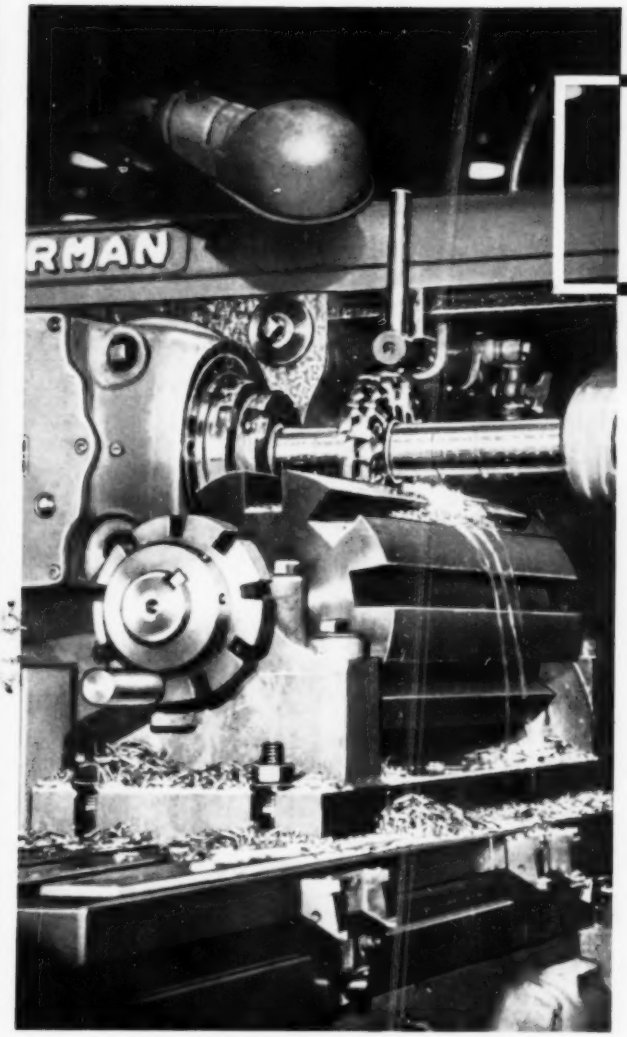

Bed-type Mills

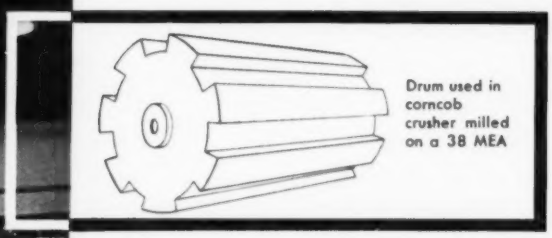
Production Grinders


Centerless Grinders

**VAN NORMAN**
*SPRINGFIELD 7, MASSACHUSETTS*

# Cost Saving Application
## *Featuring a*
# VAN NORMAN Ram-type Mill



Drum used in corncob crusher milled on a 38 MEA

Versatile, new Van Norman milling machines are today being used for a wide variety of precision milling operations by all forms of industry. One reason for the growing popularity of these production mills is the increased size of the column, ram and table, giving them greater range and versatility than ever before.

Here's but one example how a Van Norman ram-type mill is economically solving a production milling problem:

Equipped with a special indexing fixture, a Van Norman 38MEA easily mills 12 slots the length of a drum used in a corncob crusher. It mills one 1½" wide x 1¼" deep slot at a time, using two staggered milling cutters. The material being milled is 1045 steel. This large workpiece is easily handled on a standard machine having a 24¼" vertical feed and a 14" cross feed.

This is a typical illustration of the many milling jobs being done today with large capacity, heavy-duty Van Norman mills. The oversize column, ram and table mean that standard Van Norman mills can be adapted to many jobs that normally would require two or more milling machines of a larger size.

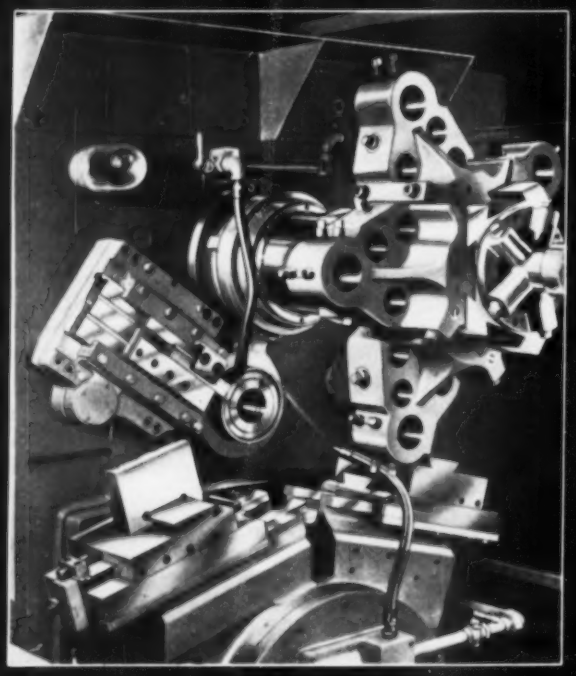
Investigate this versatile Van Norman mill today. Write for a complete catalog.

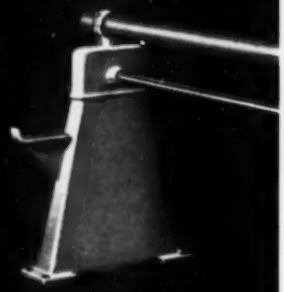
**MACHINE COMPANY**
*A DIVISION OF VAN NORMAN INDUSTRIES, INCORPORATED*

*Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.*

# NEW! WARNER & SPINDLE

## ...enables profitable small-lot production of even your most complex and precision-demanding bar jobs on a fast, automatic basis





This new 2AB machine has a 3-inch diameter bar capacity and a 9½" working stroke. A unique all-clutch speed transmission eliminates changing speed pick-off gears and provides two ranges of six automatically selected speeds: From 120 to 1544 rpm in the High Range, and 56 to 728 rpm in the Low Range. Right or left-hand threads can be cut from 7 to 32 tpi. Six automatically selected feeds are available from a 36 feed range (.0019" to .124") in addition to six independent cutoff feeds ranging from .0015" to .020".

Now, the shop-proven, cost-cutting features which have made Warner & Swasey Automatic Chuckers so outstanding in their field are available in a new Single Spindle Bar Automatic. Most important among the profit-producing features of this new Warner & Swasey 2 AB are:

● **FASTER SETUPS**—With no cams to change, time-consuming set-up procedures, usually encountered with automatic bar machines, are eliminated. Even your smallest lot bar jobs can now be produced economically on an automatic basis.

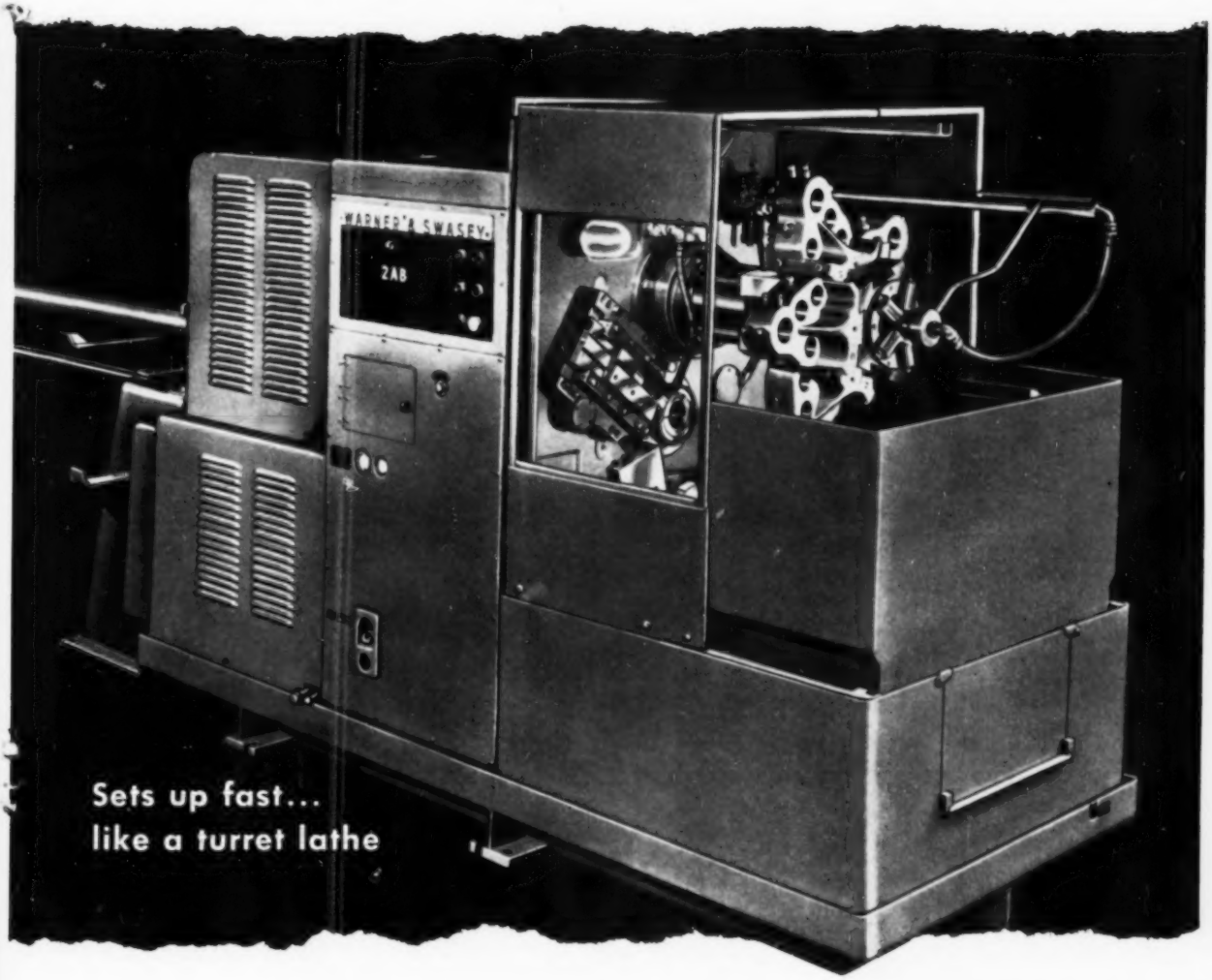
● **GREATER ACCURACY**—Only two wide—and widely-spaced—bearing surfaces support the turret. Thus, cumulative tolerance problems in conventional "multiple bearing" turret location designs are eliminated.

● **EASIER TOOLING FOR COMPLEX WORK**—Flexibility and accessibility of the 2 AB's cross slides and pentagon turret enable the use of a wide variety of machining methods. One operation usually handles even the most complex workpieces.

● **POWER FOR TOMORROW'S JOBS—TODAY**—The 2 AB's 25 horsepower, reversible motor more than meets today's rugged metal removing requirements and, coupled with a wide range of spindle speeds, permits the efficient application of the latest cutting tool materials.

● **"FREE" CUT-OFF TIME**—An independently-operated cut-off slide allows full utilization of both front and rear cross slides. The cut-off cycle may be started during

# SWASEY 2AB SINGLE AUTOMATIC BAR MACHINE




any one of the pentagon turret stations. Thus, cutoff can be progressing during subsequent machining providing a cut-off cycle which is virtually "free".

● **AUTOMATIC RESTOCKING INDICATOR**—This ingenious device in the hydraulic bar feed mechanism automatically stops the 2 AB and lights an indicator light on the operator's control panel before the bar being machined runs out—prevents tool damage from improperly-gripped stock.

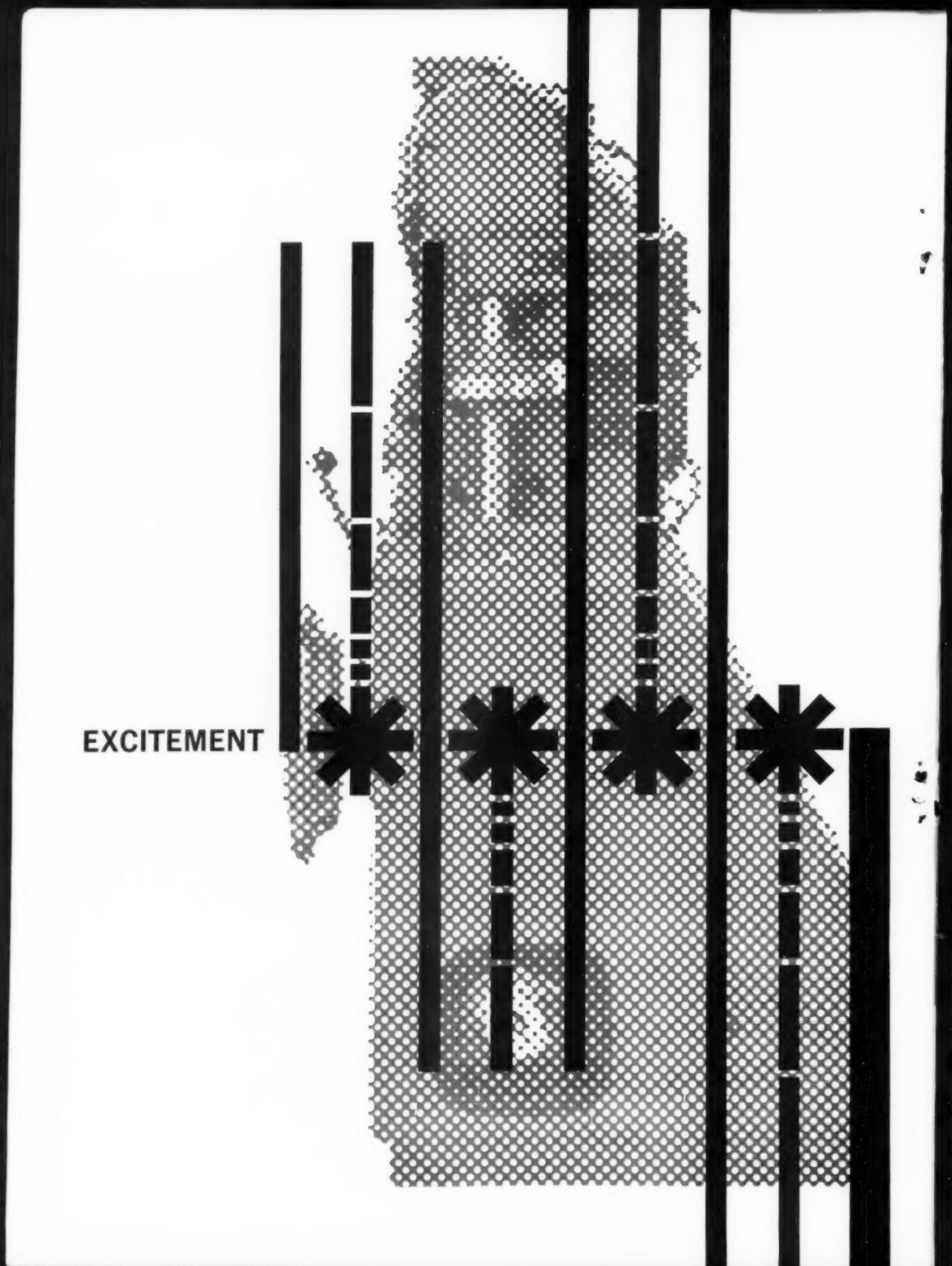
Why not call your nearest Warner & Swasey Field Representative and get the complete story on the new 2 AB. It can help increase both production and overall profits—so important in today's highly competitive picture.

WARNER & SWASEY
*Cleveland*
PRECISION MACHINERY SINCE 1880

NO MATTER WHICH WAY YOU TURN
...WARNER & SWASEY CUTS COSTS



CIRCLE 183 READER SERVICE CARD

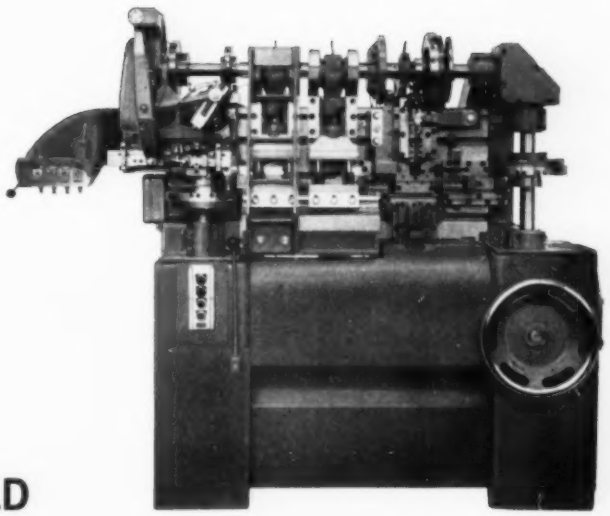

EXCITEMENT

**O**nce in a blue moon, a really exciting new production machine is developed . . . and this is it!

**I**t's the Torrington **Verti-Slide** which promises a genuine revolution in the production of just about everything in strip forming that is now being produced by progressively tooled presses.

**S**ingle-handed, the Torrington **Verti-Slide** has already demonstrated its ability to replace as many as six presses in high speed precision production of complex parts.

**C**ooler heads than ours are telling **us** that it's the most exciting new development in its field in half a century.



## IN THE PRODUCTION WORLD

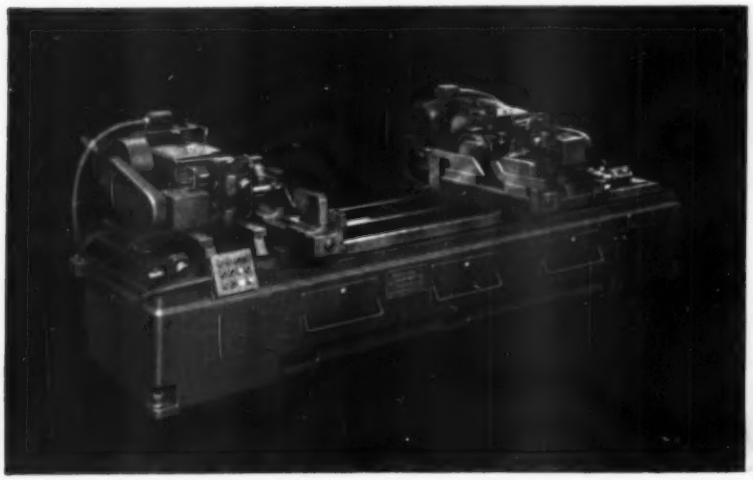
**W**rite or call today for complete data—or a Torrington sales engineer.

**THE TORRINGTON MANUFACTURING COMPANY**
TORRINGTON, CONNECTICUT · VAN NUYS, CALIFORNIA · OAKVILLE, ONTARIO

◀ CIRCLE 184 READER SERVICE CARD

CIRCLE 185 READER SERVICE CARD

# These MOTCH AND MERRYWEATHER precision



**MILL & CENTER**

Model MC 1648. Incorporates two standard milling heads and two standard drilling heads. Feed rates infinitely variable. Right hand unit is adjustable for varying part lengths. Fixtures are self-equalizing vises. Milling and drilling units, and clamping fixtures are hydraulically actuated and electrically controlled.

Available in two sizes: 1″ to 6″ diameter; 8″ to 48″ length, with 20 horsepower heads; and 1″ to 4″ diameter; 6″ to 24″ length, with 5 horsepower heads.

# cut production costs...

**UPRIGHT DRILLING & BORING MACHINE**

Model VS 2615. Designed for heavy duty drilling and boring. This machine will accommodate many types of heads, making it adaptable to a wide variety of machining operations. Its standard automatic cycle consists of rapid traverse down, feed, and rapid return. Variations of this automatic cycle are available.

Available with speeds from 30 to 190 RPM, up to 40 horsepower, stroke of either 15″ or 30″, variable hydraulic feed, with maximum pressure of 20,000 pounds.

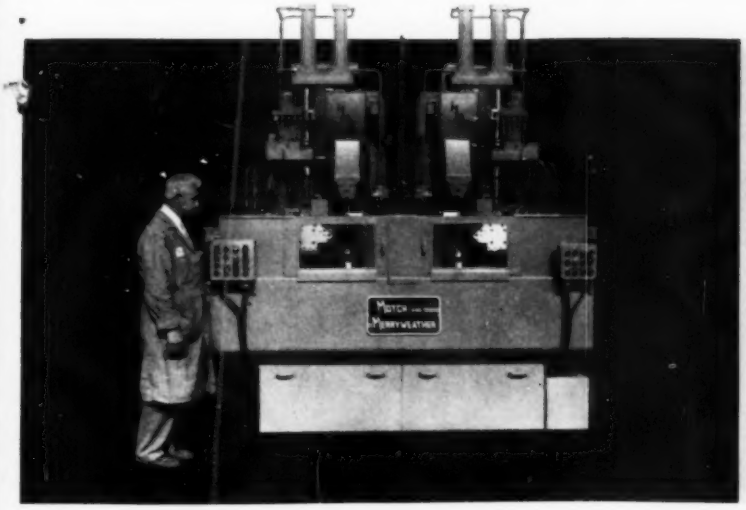
**SINGLE END MILL & CENTER**

Model SMC. Ideal for tool room or production work. Incorporates standard slide, milling and drilling head, adjustable stock support and stop assembly. Speed of milling and drilling head unit varied by changing easily accessible pulleys and belts. Performing both milling and drilling during one clamping, work is milled square to the center.

Available with diameter from ¾″ to 3½″, length from 4½″ to 48″, and 5 horsepower on the milling head.

# speed up subsequent

# performance machines...

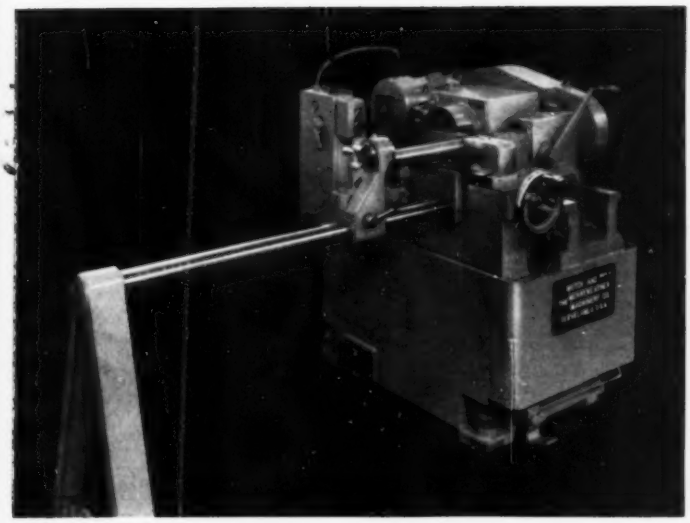


**TWO-SPINDLE VERTICAL TURNER**

Designed for precision, production-type turning, boring and facing. Two hydraulically-operated, automatically lubricated tool slides are mounted on hardened and ground steel ways with tapered gibs for accurate alignment. Spindle and slide units will operate independently, have separate controls.

Available with 20″ swing; spindle speeds from 20 to 5000 RPM; stroke—horizontal 6″, vertical 12″; and variable hydraulic feed.

Partial view of M&M's expanded Cleveland facilities. Why not visit us at your first opportunity?



# operations

• Keeping pace with the increasing need for flexibility in standard metalworking machinery, M&M offers industry these four highly-flexible, readily-adaptable machine tools.

To learn how they can add flexibility —and dependability—to your machining operations call your Motch & Merryweather representative, or write directly to Motch & Merryweather Machinery Company, 1250 E. 222nd St., Cleveland 17, Ohio.

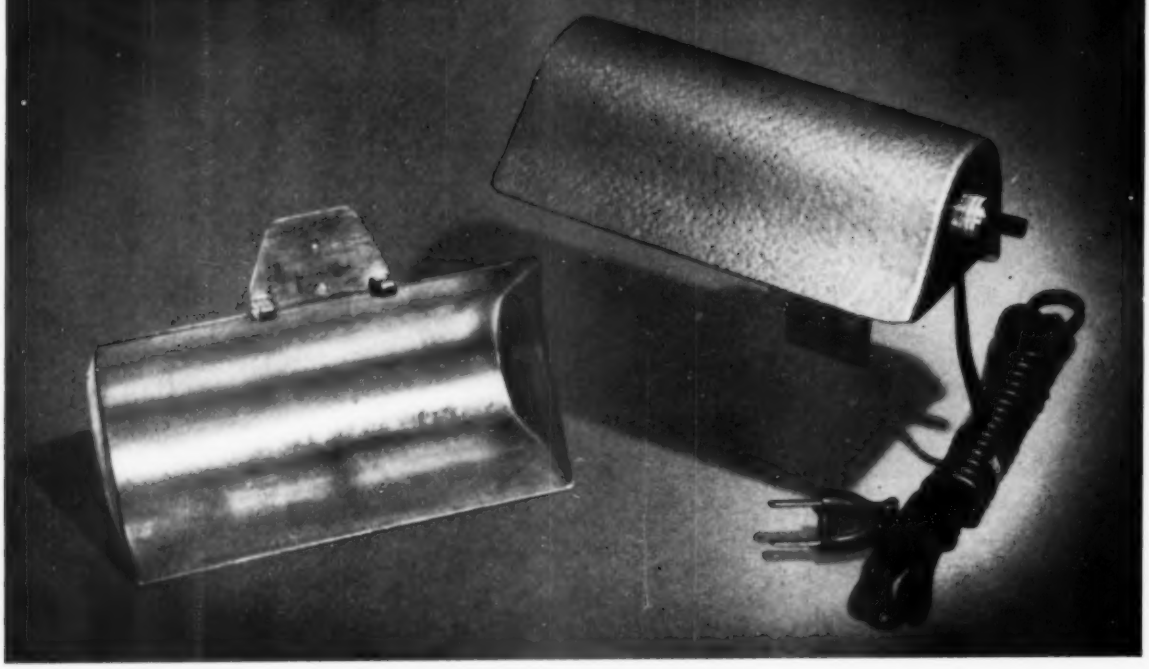
Machine Tool Manufacturing Division
Cutting Tool Manufacturing Division
**CLEVELAND**
Avey Division, Cincinnati

***BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, TURNING AND DRILLING MACHINERY***



CIRCLE 187 READER SERVICE CARD

# IT'S LIGHTER THAN YOU THINK!



## AND EASY TO ASSEMBLE WHEN DIE CAST WITH... ZAMAK

The shade for this new KLIP-LITE* music stand is made of a single thin-wall zinc die casting—for light weight and low-cost assembly. As thin as a stamping but with far greater rigidity, the contours could not be duplicated in sheet metal.

By designing for die casting, only 4 holes are needed before spray finishing and assembling the socket-switch and mounting bracket.

These extremely thin wall sections—possible only with ZINC die castings—minimize weight and are stronger in proportion to thickness than heavier sections.

Parts designed for ZAMAK alloy die casting will meet competition of either stampings or aluminum castings—and at lower cost.

*Made by WIESE MANUFACTURING COMPANY—Davenport, Iowa.

THE NEW EDITION OF "THE END USES OF ZINC DIE CASTING"

SEND FOR YOUR COPY TODAY

*HORSE HEAD® SPECIAL ZINC AND HORSE HEAD ZAMAK ARE PRODUCED BY*

## THE NEW JERSEY ZINC COMPANY

*DEVELOPERS OF THE ONLY STANDARD ZINC DIE CASTING ALLOYS IN USE TODAY*

**160 Front Street • New York 38, N. Y.**

HORSE HEAD PRODUCTS®



CIRCLE 188 READER SERVICE CARD

CIRCLE 189 READER SERVICE CARD ►

# "American" TRACER LATHES

Bulletin
No. 135

gives a complete description and shows many examples. It's yours for the asking.

The Mechanical Division of General Mills, Inc. in Minneapolis, Minnesota uses "AMERICAN" Tracer Lathes for their contouring work. 17 years of ordnance and instrument work have conclusively demonstrated to the General Mills officials that only the highest quality equipment can produce the precision work that their contracts require—result "AMERICAN" selection.

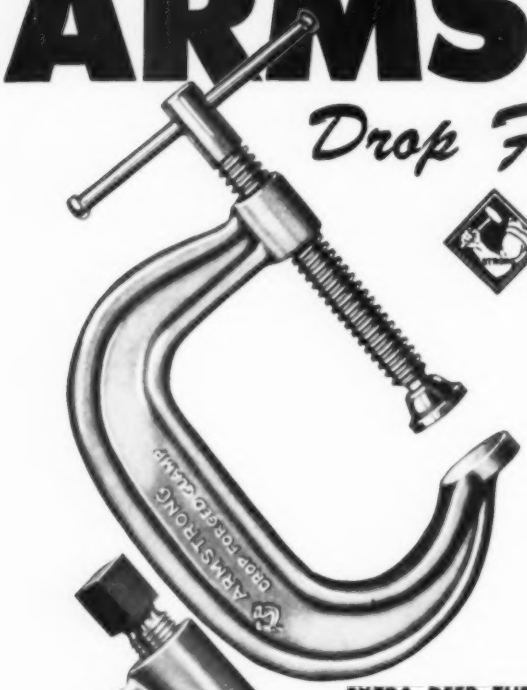
More production per man hour is the answer and only answer to spiraling costs—modern, high production machinery is the answer to greater production per man hour. Judging from reports, the Mechanical Division of General Mills, Inc. has found this to be true.

**THE AMERICAN TOOL WORKS CO.** Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

# ARMSTRONG

## *Drop Forged* CLAMPS




**LEADERS IN THE DROP FORGED CLAMP FIELD** . . . in design, machining and strength; in completeness of line in both sizes and types.

Designs are based on a full knowledge of clamp uses and requisites. Drop forging assures die-perfect form, texture toughness and freedom from structural faults. Maximum stiffness is attained by a discerning selection of steels with accurate controlled heat-treating, tempering and testing.

For dependability and long useful life, specify and standardize on ARMSTRONG Drop Forged Clamps.

**EXTRA DEEP THROAT "C" CLAMPS**

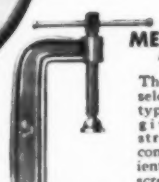
Provide extra clearance required for some work. Extremely stiff for weight. Screws and hubs are accurately machined and aligned with machined seats; have sliding pin handles and free-acting swivel caps on point. Bodies have smooth sandblast finish.
(8 sizes to 12" opening)

**Write for new ARMSTRONG General Catalog showing almost 5000 industrial tools.**

**ARMSTRONG BROS. TOOL CO.**
**5215 W. ARMSTRONG AVE. • CHICAGO 46, U.S.A.**

**HEAVY DUTY "C" CLAMPS**

Universally recognized as strongest "C" clamps made. Longer hub holds screw alignment against terrific side strain; permit tighter clamping and multiplies thread friction against loosening. Extra large screws are heat treated and hardened at point.
(11 sizes to 12½" opening)



**MEDIUM SERVICE "C" CLAMPS**

The design and careful selection of steels in this type clamp combine to give it maximum strength and stiffness consistent with convenient weight. Heat treated screw with sliding pin handle and swivel cap on point. Ground seat.
(9 sizes to 18" opening)

**TOOL MAKERS "C" CLAMPS**

Quality steels, drop forged, heat treated and accurately machined with ground seats. Drop forged screws have both "wing nut" handle for convenience and square necks for tight setting with a wrench. Either "plain" or "swivel" screw types.
(Four sizes: 1", 2", 3" or 4" maximum opening)

**SPATTER RESISTANT WELDERS "C" CLAMPS**

Extra Deep Throat Pattern (see above). Body, Swivel and Screw are cadmium plated over all to resist welding spatter.
(8 sizes Capacities to 12" opening)

**MACHINISTS' CLAMPS**

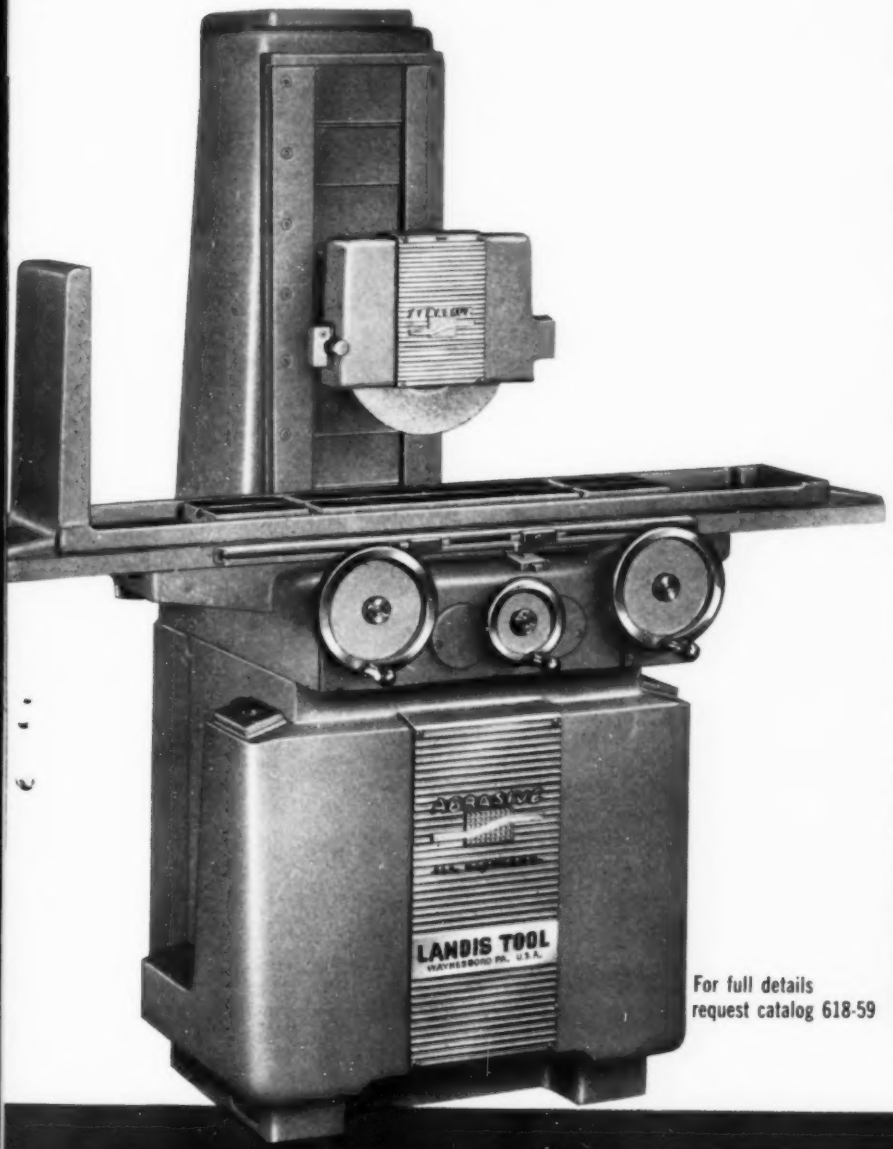
Jaws drop forged, carefully machined and hardened, are extra heavy; will not bend or spring on a short bite and are faced true. Will grip non-parallel surfaces because the under face of the center screw is convex, fitting into a concave seat for tilting.
(Four sizes: Capacities to 4¼" opening)

**PARALLEL CLAMPS**

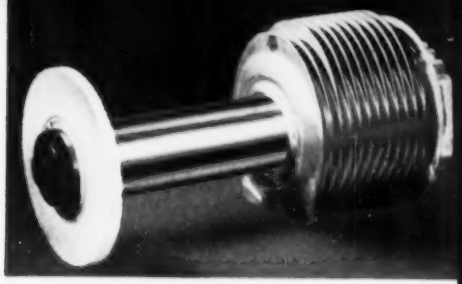
Carefully machined from selected grade steel and hardened. Particularly suited for holding work together when drilling or tapping. Rounded jaw ends increase clearance in close quarters. Spring clip holds loose pin in alignment while tightening or loosening.
(3 sizes: Capacities to 2½" opening).

# For the **best buy** in high precision surface grinders

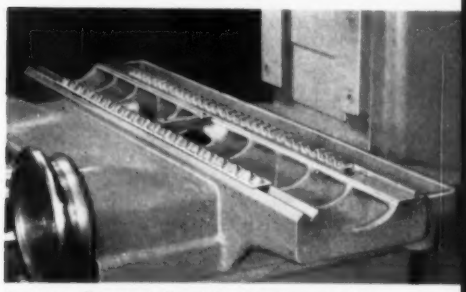
**Landis Abrasive 618—built to Landis precision grinder standards**



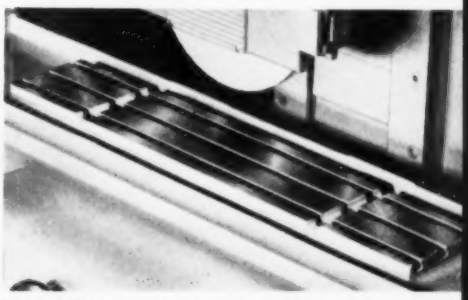

For full details request catalog 618-59



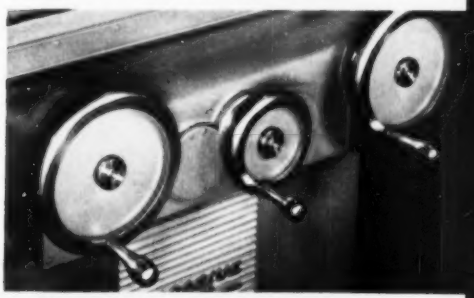
**Accuracy with Heavy Stock Removal**—Unit motorized spindle, dynamically balanced. Supported by two super precision preloaded bearings at each end.



**Accurate Slot and Shoulder Grinding**—Roller bearing ways with backlash eliminator on saddle assure positive accuracy.



**Close Tolerances**—Heavily ribbed table, extra thick saddle and widely spaced ways assure accuracy even under overload conditions.



**Sensitive Precision Controls**—Feed increments of .0001" on head. Crossfeed graduated in .001" with adjustable vernier in .0001".

**ABRASIVE**
precision surface grinders

a product of
**LANDIS TOOL**
world's largest manufacturer of precision grinding machinery
WAYNESBORO, PENNSYLVANIA

# NOW...you can get

## TYPE No. 01 (A.I.S.I. or S.A.E. ANALYSIS)

# FLAT GROUND DIE STEEL

## OIL HARDENING

# from SIMONDS

For tool makers, die shops and machinists who prefer or who have standardized on Type No. 01 Oil Hardening Steel, SIMONDS now offers the most complete range of stock sizes in flats and squares made from Simonds own steel of No. 01 chemical analysis.*

Precision ground and ready-to-use, all "1001" sizes are accurate and uniform in dimension and have an extra smooth surface with edges and ends finished and squared. Heat treatment is simple and foolproof, with excellent results assured. Best of all, you can get delivery now of No. 01 Type as well as Air Hardening and Low Carbon Type Flat Ground Steel from Simonds distributors' stocks backed up by Simonds warehouse stocks in Boston, Newark, N. J., Detroit, Chicago, Shreveport, La., Los Angeles, San Francisco and Portland, Oregon.

For Fast Service from Complete Stocks Call your SIMONDS Industrial Supply DISTRIBUTOR

**SIMONDS SAW AND STEEL CO.**
FITCHBURG, MASS.

*Factory Branches in Boston, Newark, N. J., Detroit, Chicago, Shreveport, La., Los Angeles, San Francisco and Portland, Ore. Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Heller Tool Co., Newcomerstown, Ohio Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada*

*

CHEMICAL ANALYSIS
Spheroidize Annealed — Non-Deforming
Type No. 01 Oil Hardening
**Flat Ground Die Steel**

| | | | |
|---|---|---|---|
| C | .85- .95 | Cr | .40-.60 |
| Mn | 1.00-1.25 | W | .40-.60 |
| Si | .20- .40 | V | .10-.20 |

Hardening Range — 1450° to 1500°F.

SIMONDS AIR HARDENING
(5% chrome)
Spheroidize Annealed — Non-Deforming Type
**Flat Ground Die Steel**
*Chemical Analysis*

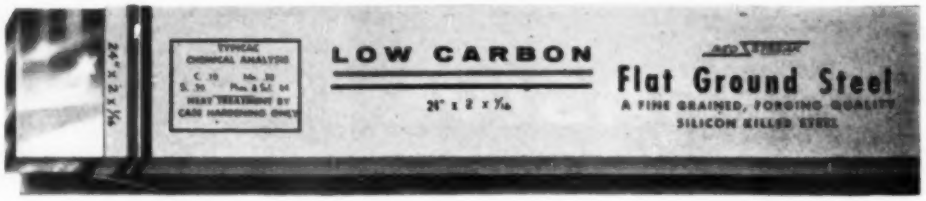
| | | | |
|---|---|---|---|
| C | .95-1.05 | Cr | 5.00-5.50 |
| Si | .30- .50 | Mo | .90-1.10 |
| Mn | .50- .70 | V | .20- .30 |

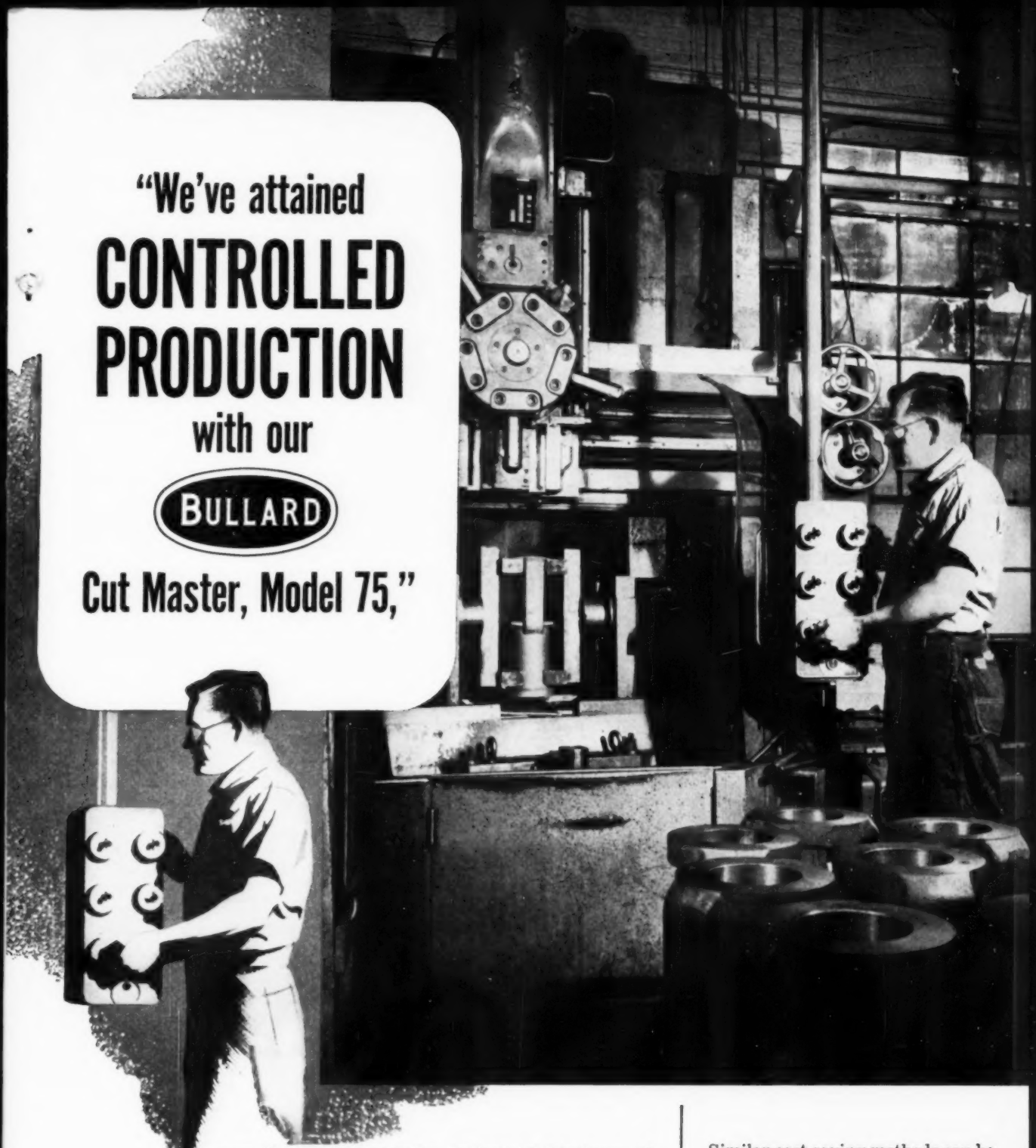
Hardening Range — 1700° to 1800°F.

SIMONDS LOW CARBON
Fine Grained — Silicon Killed
**Flat Ground Steel**
*Typical Analysis*

| | | | |
|---|---|---|---|
| C | .18 | Si | .20 |
| Mn | .50 | S | .04 |
| | P .04 | | |

Can Be Case Hardened Only





# "We've attained CONTROLLED PRODUCTION with our BULLARD Cut Master, Model 75,"

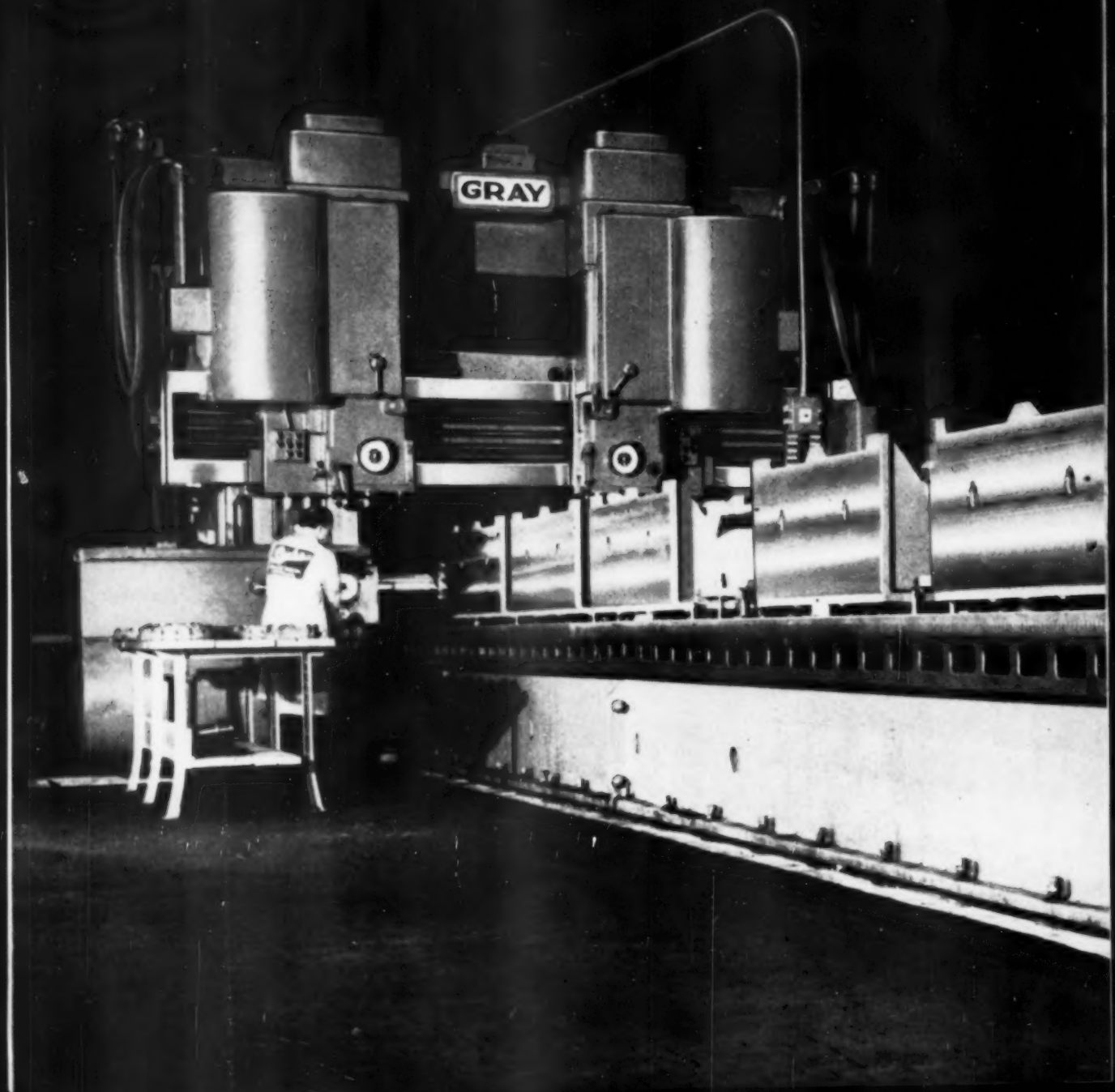
says Mr. Anthony Scelba, Industrial Engineer of Leslie Co., Lyndhurst, New Jersey, manufacturers of regulators and controllers for industrial and marine steam systems.

Combining a specially designed indexing fixture, which permits indexing the piece in increments of 45° and with the automatic features of Cut Master, every piece leaving the machine is completely finished on all surfaces. This reduces the number of set-ups, for instance, on a four way valve from four set-ups to one. In this manner, production is controlled and a minimum inventory required.

Similar cost saving methods can be applied to your machining problems just call your nearest Bullard Sales Office or Distributor.

**THE BULLARD COMPANY**
BRIDGEPORT 9, CONNECTICUT

# progress starts

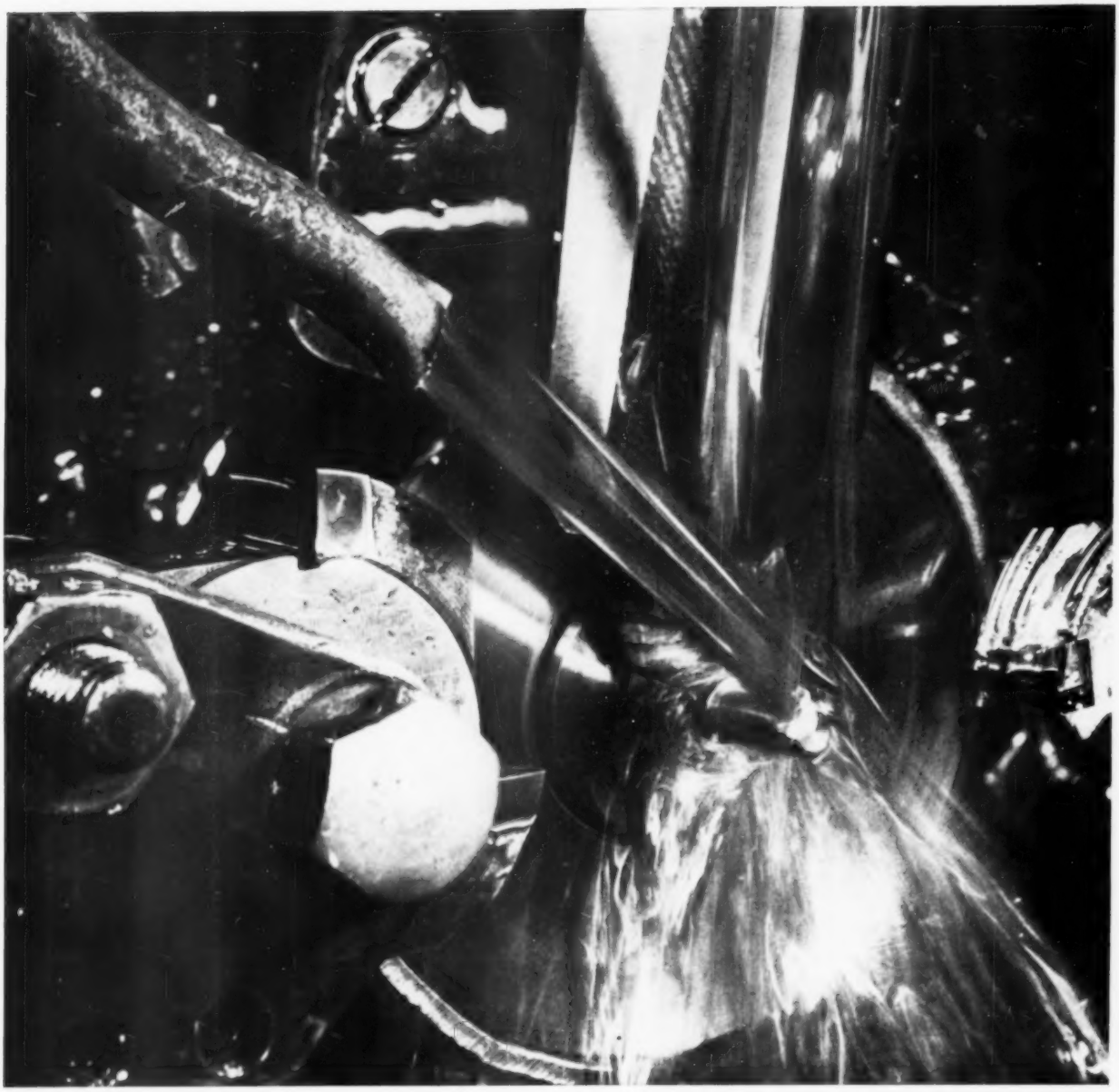


# on a GRAY

What you see being milled on this big 105 foot long Gray, are transfer machine bases of the future...six at a time...automation production machines of Buhr Machine Tool Co., of Ann Arbor, Michigan. It's logical that this company, engaged in producing cost cutting, time saving equipment, should select a cost cutting, time saving Gray to do the job.

Gray unit head planer type millers dominate the field of modern heavy duty milling. This 66" x 66" x 50' giant can simultaneously deliver 300 H. P. to its four cutters. Duplex tables virtually eliminate idle time by permitting work set-up on one section, while work is being milled on the other section. Unusually simple control encourages maximum operator efficiency. All this, plus mirror smooth surfaces milled to precise tolerances maintain the Gray reputation for top quality the world over.

The G. A. GRAY Co., Cincinnati 7, Ohio



## 10 years of successful operation with Gulfcut, on varied

# GULF MAKES THINGS

From movie camera and slide projector components to garden hose nozzles and worm gears for Venetian blinds —no machining job is too different or too tough for Waterbury Machine Tools & Products Company, Inc. of Waterbury, Connecticut.

And no brand of cutting oil gives them the consistently good results they get with Gulfcut oils.

"We've been using Gulfcut for over 10 years on thousands of really tough machining jobs," says Edward H. Somma, Secretary and General Manager of the firm. "Gulfcut has contributed a great deal to our company's success in this highly competitive field."

Closer tolerances. Finer finishes. Higher cutting speeds. Longer tool life. These are the big advantages Mr. Somma finds with Gulfcut. Plenty of proof that Gulf makes things run better!

A typical machining job at Waterbury Machine Tools & Products is illustrated above. Workpiece was a close-

Smooth finish, using Gulfcut at Waterbury Machine Tools & Products Company. Job: Pivot pin for automotive ignition system. Material: ¼" diameter Naval Brass. Depth of cut: .065". Feed: .006 ipr. Machine speed: 4,260 rpm. Tolerance: .002" on back diameter, .0002" on front diameter. Finish: Excellent.

Edward H. Somma, left, Secretary and General Manager of Waterbury Machine Tools & Products Co., with Peter Eaton, Gulf Sales Engineer. Brown & Sharpe miller at right uses Gulfcut Heavy Duty Soluble Oil, chosen because of its better cooling on the wider surfaces of the milling cutter and for longer tool life.

## and tough machining jobs, prove

# RUN BETTER!

tolerance pivot pin for contact set used in automotive ignition systems. Material was Naval Brass. Gulfcut helped achieve an extremely fine finish at a production speed of 10⅝ seconds for each piece.

See how Gulf makes things run better in *your* shop. Whatever type of machining you do, there's an oil in the complete Gulfcut line to meet each specific need.

Call a Gulf Sales Engineer at your nearest Gulf office, or mail coupon for pamphlet on Gulfcut cutting oils.

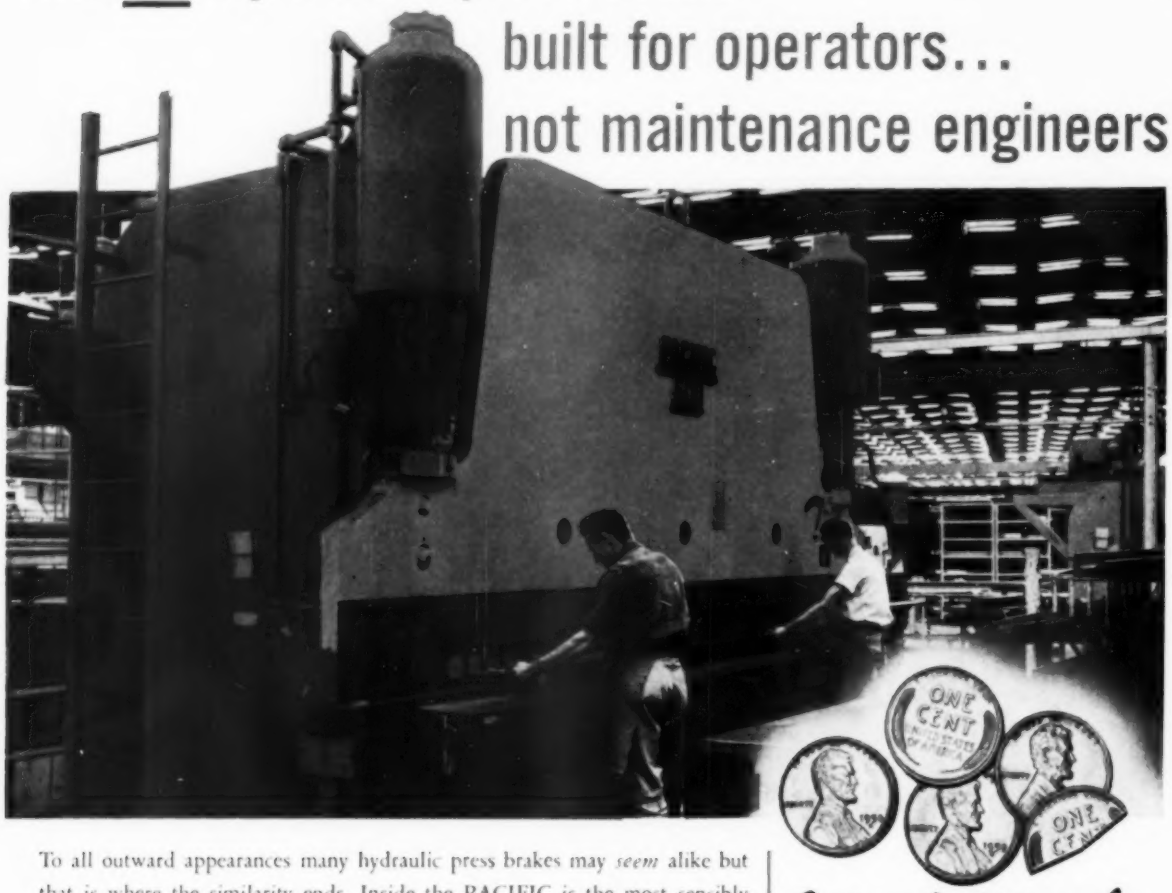
GULF

**GULF OIL CORPORATION**
Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.
Send me pamphlet on
☐ Gulfcut "regular" cutting oils.
☐ Gulfcut Heavy Duty Soluble Oils.

Name_____
Title_____
Company_____
Street_____
City_____ Zone___ State_____

AM-0118

# The one hydraulic press brake built for operators... not maintenance engineers



To all outward appearances many hydraulic press brakes may *seem* alike but that is where the similarity ends. Inside the PACIFIC is the most sensibly simple, patented level control system ever devised . . . only 6 microswitches and 2 relays provide the precise PACIFIC accuracy that no other hydraulic press brake can even remotely approach. Free of lineal variable differential transmitters, electronic amplifiers, photo-electric relays, amplidyne generators, complex hydraulic servo-valves, variable volume pumps and other complicated gadgets, PACIFIC hydraulic press brake can be kept in continuous operation by the ordinary plant maintenance man without the costly services of a professional hydraulic or electronic engineer from some distant factory. PACIFIC can be maintained for pennies per operating hour . . . only a fraction of the cost of the complicated machines.




***Costs only 4.4¢ per hr. to maintain . . .***

**EARNS $7.50 NET PER HOUR**

**Pacific Hydraulic Press Brake at Atlas Universal Service, Inc., San Francisco, has operated continuously 16 hours a day for 9 years and 27 days with average maintenance downtime of only 5.2 hours per year and a total maintenance expense of 4.4¢ per operating hour.**

*Write for brochure*

**PACIFIC INDUSTRIAL MANUFACTURING COMPANY**

**PACIFIC HYDRAULIC BRAKE**

848 49th AVE., OAKLAND, CALIF.
PLANTS:
OAKLAND, CALIF. and MT. CARMEL, ILL.

DISTRIBUTORS

ALBUQUERQUE, N. M., DENVER, COLO.—R. E. Dubac Associates · BIRMINGHAM, ALA.—W. H. Sleeman · CHICAGO, ILL., MILWAUKEE, WIS., MINEAPOLIS, MINN.—The Gute Co. · CLEVELAND, OHIO—Wigglesworth Machinery Distributors · DALLAS, TEX.— Machine Tool Associates · DETROIT, MICH.—Taylor-Thompson Machinery Co. · HOUSTON, TEX.—Butcher, Carter & Preston Co. · INDIANA, LOUISVILLE, KY.—Harry B. Green Machinery Co. · KANSAS CITY & ST. LOUIS, MO., DES MOINES, IOWA—Moehlenpah Engr. Co. · LOS ANGELES, CALIF., ARIZONA—Tornquist Machinery Co. · MT. VERNON, N. Y.—William Halpern & Co., Inc. · NEW ORLEANS, LA.—Dixie Mill Supply Co. · NORFOLK, VA.—Tidewater Supply Co. · PITTSBURGH, PA.—Steel City Tool & Machinery Co. · PORTLAND, ORE.—Portland Machinery Co. · ROCHESTER, N. Y.—Ogden R. Adams Co., Inc. · SALT LAKE CITY, UTAH—Todd Machinery Co. · SEATTLE, WASH.—Buckner Weatherby Co. · TULSA, OKLA.—Martin Machinery Co. · WETHERSFIELD, CONN.—Beisel Machinery Co. · WYNNEWOOD (suburb of Philadelphia), PA.—Edward A. Lynch Machinery Co. · TORONTO, ONT.—Hercules Presses, Ltd.

# PRODUCTION POINTERS from GISHOLT

More cost-cutting IDEAS– to help you

## NEW HS BALANCER SAVES, UPS ACCURACY FOR BARBER-COLMAN

### Simplifies balancing of small high-speed, lightweight work

This setup at Barber-Colman Company, Rockford, Illinois, will show you how to cut balancing costs and improve accuracy on miniature high-speed work.

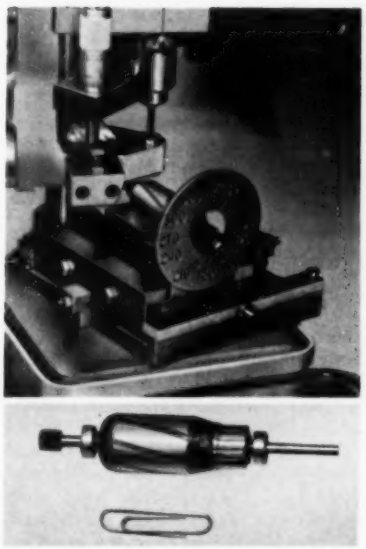
The workpiece, an aircraft control motor armature assembly, weighs 2¼ oz., operates at 13,600 r.p.m. Bearing movements must not exceed 0.000050″. Unbalance is corrected by drilling at the 0.245″ O.D. radius, in two transverse planes only ½″ apart.

All requirements are easily met on a new Gisholt HS-1 Balancer. Work is placed in a special fixture and is driven by a rubber belt on the O.D. The operator notes the angle and amount of unbalance in both correction planes. Next, he places the work in a correction drilling fixture. To correct in each plane, he adjusts a micrometer stop to the depth indicated by the amount meter. The part is oriented angularly by reference to a 360° protractor, and correction is made. A suction device removes all chips. Since drilling is permitted only in the lands, correction cannot be made at the exact angle in all cases and a second run may be required. Up to 15 parts per hour are measured, corrected and inspected for balance with this setup.

A complete line of high-speed (HS) bench-type balancers (horizontal and vertical models) is available for workpieces from ½ to 8 oz. or from 8 oz. to 10 lb. Belt-, air- or electrically self-driven parts or assemblies containing high-speed rotating parts such as miniature armatures, aircraft and missile gyros, small spindles, turbines, etc., are easily handled. Unbalance causing work support movements greater than .000002″ can be accurately measured and located with the work rotating at any speed between 1000 and 3000 r.p.m. or between 4000 and 12,000 r.p.m.

As on all Gisholt Balancers, operation is simple and does not require skilled personnel. Regardless of workpiece weight or method of drive, unbalance can be accurately measured and located in two transverse planes, as little as ¼″ apart, with unbalance indications in one plane completely unaffected by unbalance in the other. Accuracy is not affected by extraneous vibrations or electromagnetic disturbances, including those set up by electrically self-driven assemblies.

***For more information on the NEW Gisholt HS Balancing Machines, contact your Gisholt Representative or write for literature —Form No. 1207.***



Correction drilling fixture built by Gisholt to meet accuracy requirements of work. Micrometer stop adjusts to indicated drill depth; 360° protractor speeds angular orientation.

Close-up of armature assembly, weighing 2¼ oz., compared to standard paper clip.

Close-up of armature assembly in special fixture that permits balancing on its own bearings. Note photocell at right, triggered by angular reference mark on work, used to energize angle meter.

Accessory equipment for this setup includes a separate direct-reading angle meter and correction drilling equipment. Corrections may be made in two transverse planes, as little as ¼″ apart, to full machine accuracy.

## HOW MACHINE SPECIALTIES CUTS COSTS ON JOB-LOTS

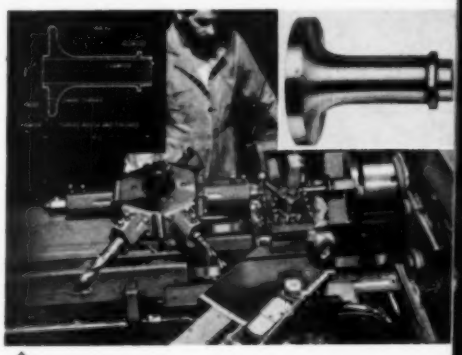
### JETracer and automatic drive team up to speed machining

Doing job-lot work requiring close estimates and minimum equipment investment? Then you'll want to study this setup at Machine Specialties, Chicago, Illinois. It saves time and improves accuracy and finish on steel outer flange support castings.

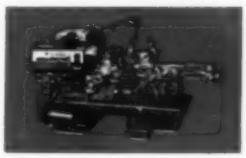
Two MASTERLINE No. 5 Ram Type Turret Lathes are used. Both machines have automatic drives to provide automatic chucking turret lathe efficiency. One has a JETracer, mounted on the rear of the cross slide, to simplify machining of the O.D. contours.

The parts are machined in 100-piece lots in three operations. The first operation setup is shown. Work is held in an air-operated fixture, chucking on the rough flange O.D. Hex turret tools, controlled by the automatic drive, center-drill, drill halfway through and chamfer the bore. Automatic cycle holds while a form tool on the front of the cross slide forms a radius, and the JETracer is used to generate the O.D. contour and face the end. Time, just 7.0 minutes f.t.f.

The other end is machined and the bore is finished on the second automatic drive-controlled No. 5 in only 7.0 minutes, f.t.f. Then the parts go back to the JETracer-equipped lathe where the O.D. contour is finish-traced, to a 125 micro-inch RMS finish, and the radius is finish formed from the front of the cross slide, in only 2.5 minutes, f.t.f.



Automatic drive controlled No. 5 ram with JETracer on rear of cross slide. Automatic cycle performs standard machining from hex turret. Cross slide used separately to plunge form from front and trace from rear.



***Automatic drive permits more accurate cost estimates, eliminates chance of human error, provides consistent quality and maximum tool life. JETracer simplifies O.D. contour machining. Operator handles two machines boosting production, cutting costs.***

## PRODUCTION INCREASED 400% WITH CENTER-DRIVE SUPERFINISHER

### Special Superfinisher cuts handling time and saves floor space

Here is another case where a Gisholt Superfinisher not only takes a substantial bite out of production costs, but improves accuracy and concentricity as well.

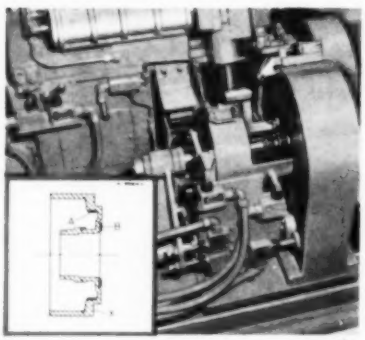
The job: producing a controlled finish in the piston bore and on the opposite thrust face of cast iron transmission clutch piston cylinders. Normally, to meet production requirements, four manually operated machines would be used. Here a special center-drive Superfinisher handles both surfaces simultaneously in one fast, automatic cycle.

Basically the machine is a standard Gisholt Model 51-A General-Purpose Superfinisher. A hollow, center-drive spindle, with a holding fixture, is mounted at the center of the bed casting. The workpieces are "banked" in a loading chute. They roll by gravity into clamping position. A loader at the spindle left, "pushes" the work into the center-drive fixture, locating against face X. Sufficient pressure is maintained to clamp the work during Superfinishing.

A stone-carrying quill above the loader moves down, over into the bore, then up, to Superfinish diameter A (from 125-300 to 15 micro-inches RMS, removing .001″ of stock or less). At the same time a cup-stone on a separate motor driven rotating quill at the spindle right, Superfinishes thrust face B (from 200-300 to 15 micro-inches RMS, removing from .002″ to .003″ stock).

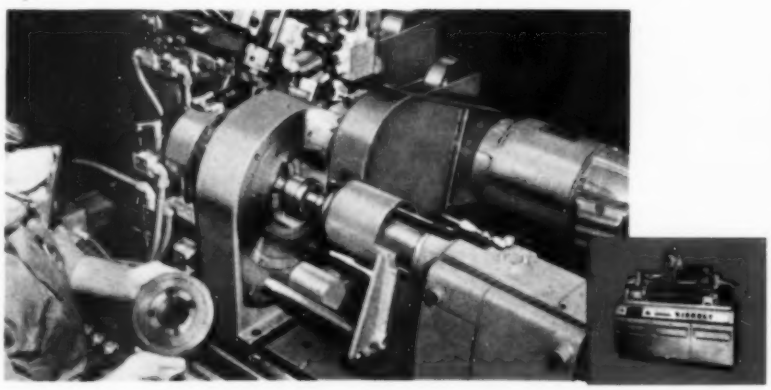
At cycle end, the loader retracts, tripping an ejector causing the work to fall into an unloading chute. The chute tips, rolling the finished part onto an outgoing conveyor. Time, from parts bank to outgoing conveyor, just 21 seconds.

***Special Gisholt 51-A Center-Drive Superfinisher completes critical piston bore diameter and opposite thrust face in one chucking—improving quality, concentricity and cutting handling time 75%.***



Critical surfaces on both sides Superfinished in one operation. Here stone-carrying quill about to engage piston bore diameter. (Stone life—400 to 450 pieces.) INSET—workpiece showing surfaces handled.

Cup-stone Superfinishes thrust face. (Wheel life of 200 to 250 pieces.) Note load and discharge chutes at upper right and rear.



## HOW A. O. SMITH CORP. CUTS REJECTS ON MOTOR FRAMES

### Auxiliary slides on No. 12 permits machining both ends simultaneously for greater accuracy

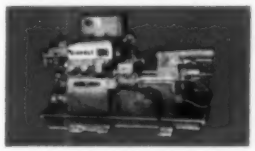
This setup used by A. O. Smith Corporation, Tipp City, Ohio, is worth remembering. It has taken over the work of two older automatic lathes. Smart tooling permits simultaneous machining of rabbet fits at both ends of electric motor frame stator and core assemblies—with the coils in place.

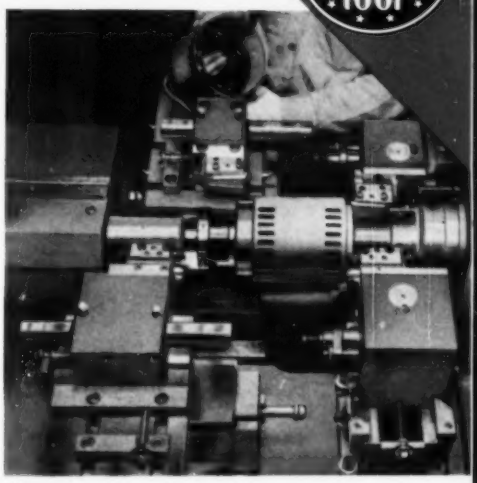
The machine: a versatile Gisholt MASTERLINE No. 12 Automatic Chucking Lathe. Special tooling: tailstock with supporting arbor; shields to keep chips out of the windings; expanding mandrel and bushings to support the work; front and rear auxiliary slides.

Here's how a typical assembly (6½" long, 6" diameter, 3½" bore) is handled: First, chip shields are inserted at both ends. The assembly is placed on the supporting arbor and the tailstock is used to press one shield against a retractable locator at the spindle end of the arbor. An expanding mandrel chucks in the I.D. Tools on the rear independent slide rough-bore the rabbet fit, rough-face and chamfer the I.D. at the tailstock end. Forward feed of this slide actuates the rear auxiliary slide to rough corresponding surfaces at the headstock end. In the same manner, tools on the front carriage and front auxiliary slide finish-bore the rabbet fits and chamfer the O.D. F.t.f. time, a fast 1.0 minute.

Over seven different sizes are handled. The most extensive change-over requires less than one hour.

***Machining both ends simultaneously speeds production, eliminates extra handling, improves accuracy. Out-of-round held within .005" total indicator reading, runout within .004" to .006" on parts up to 10" length, up to 6¼" bore.***





Overhead view of tooling and work. Note pusher bars on rear independent slide and front carriage, used to operate auxiliary slides and permit simultaneous machining at both ends.

## 5L CUTS COSTS ON 900-LB. CHUCK BODY FORGINGS

### Remote controls, compound cross slide and power chucking save time

If you're machining parts like this 900-lb., SAE 1035 steel 24" chuck body forging, you know it takes power, rigidity and versatility to handle the job at lowest cost.

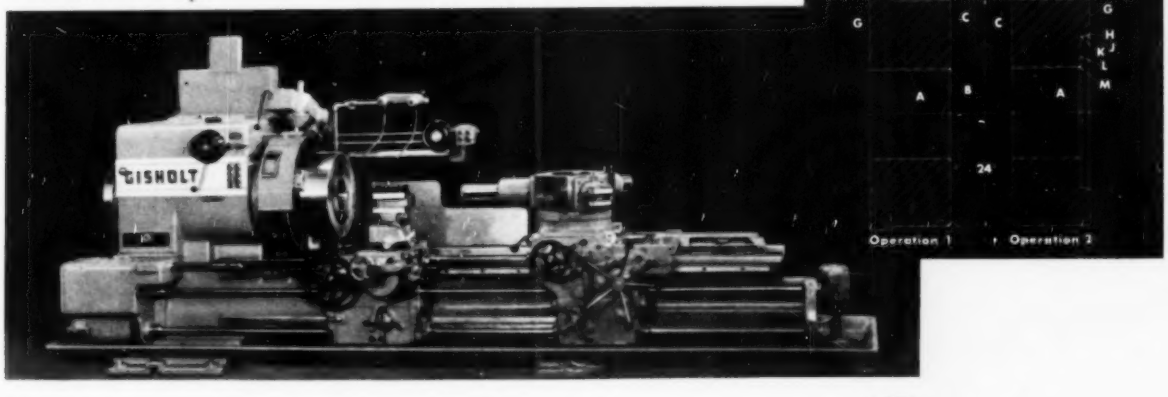
Here's how features and accessories of the Gisholt MASTERLINE 5L Saddle Type Turret Lathe make light work of this heavy job. A compound cross slide with power angular feed simplifies taper boring. A cross-feeding hex turret permits use of standard, low-cost tools for cross-facing, boring various diameters, etc. A second speed selector and remote control save steps and allow the operator to observe the work at all times while changing spindle speeds, starting, stopping, reversing and inching the spindle. Fine finish is assured through a 24-speed headstock, offering a wide choice of speeds in a range from 6 to 340 r.p.m. with maximum metal removal obtained by a 75 h.p. motor. A power hoist supports the work for chucking in a 32", 3-jaw scroll chuck.

Here's the first operation: hex turret tools bore A and face C, while square turret tools turn E and chamfer B-D. Total f.t.f. time, 30.6 minutes. This includes 4.5 minutes used to chuck, operate and unload.

For the second operation, change-over is fast and requires only minor tool replacements, stop adjustments and new chuck jaw inserts. Work is held on the previously machined O.D. Hex turret tools face G-L and bore A-K. Compound square turret tools finish-turn E, taper the co-bore J and chamfer F-H-M. Time f.t.f, 43.4 minutes, including 11.2 minutes to chuck, operate and unload.

***Power, rigidity of 31,000-lb. 5L, and proper accessories cut costs, simplify and speed machining of heavy-duty work. Second speed selector and remote spindle control save steps, permit full attention to work.***

Simple setup on 5L completes 900-lb., 24" chuck body forging in two operations. Note second speed selector and remote control at operator work station. Drawings show surfaces machined in each operation.



MASTERLINE GISHOLT SINCE 1887

# HOW LONG MFG. DIVISION CUTS TIME 30% ON CLUTCH PRESSURE PLATES

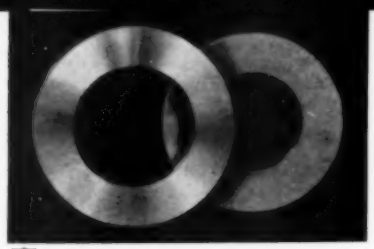
## Versatile Simplimatic replaces two lathes and one grinder

Here is a prime example of how you can cut costs, improve accuracy and quality, by combining operations on modern production equipment.

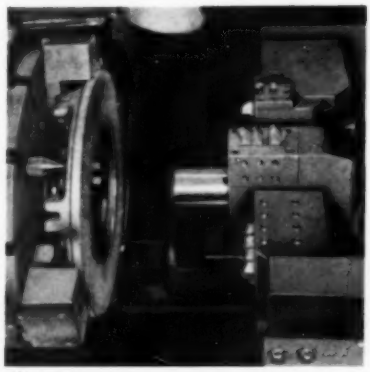
Formerly Long Manufacturing Division, Borg-Warner Corporation, Detroit, Michigan, used two semi-automatic lathes and one grinder to handle four sizes of cast iron clutch pressure plates, supplied to truck manufacturers. Now these parts are completed in one chucking on a Gisholt Simplimatic Automatic Chucking Lathe. The part shown, 16¾" in diameter, 2⅜" wide, is held in a 21", 3-jaw, air-operated chuck. Three independent tool slides are used. The wide platen table simplifies slide location, eliminates "cutting air" and provides ample support with minimum tool overhang during machining.

During the automatic cycle the platen table feeds forward, plunging four facing tools, on the front slide, to depth. Then standard slide movement feeds the four facing tools out from center, roughing the 3¾"-wide face in one-fourth the time that would be required if a single cutter were used. At the same time the center slide feeds forward with piloted tools that rough- and finish-bore and chamfer the I.D. The rear slide operates separately and carries a single tool used to finish-face the part, feeding from the O.D. to the I.D. F.t.f. time, just 3.02 minutes.

***Simple setup replaces two semi-automatic lathes and one grinder, cuts handling and machining time over 30%. Rigid tooling on platen table improves accuracy, provides desired surface finish and flatness formerly obtained by grinding.***



Clutch pressure plate (produced in lots of 1000) before and after machining. Rigid tooling provides flatness and 120-160 micro-inch RMS finish on the clutch face, formerly obtained by grinding.



Clutch pressure plate casting, showing method of chucking, locating and tooling used to complete part in one automatic cycle.

# JETRACER CUTS TIME 25% FOR RIVETT LATHE & GRINDER, INC.

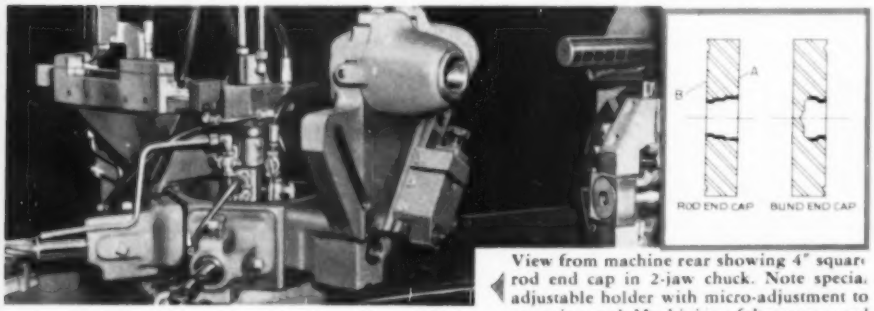
## Turret-mounted JETracer slide tool on Fastermatic simplifies job, improves quality

Want to improve accuracy and finish, and speed machining on those tough multi-diameter jobs? Here's a fresh approach used by Rivett Lathe and Grinder, Inc., at its Emery Road plant, Allston, Massachusetts. Setup includes a JETracer slide tool mounted on the turret of a Gisholt 1F MASTERLINE Fastermatic Automatic Chucking Turret Lathe.

The workpieces are end covers for tie rod air cylinders. They are made from steel blanks ranging in size from 2" square x 1½" thick to 12¾" x 2¼" thick. Ten sizes of each are handled in lots ranging from 200 to 500 pieces. Due to the increased flexibility offered by the JETracer slide tool, all work is handled from the hexagon turret. Eliminating the need for front and rear cross-slide carriage saves additional cost.

All parts are held in an 18", 2-jaw air-operated chuck. The typical rod end cap shown, 4" square x 1¾" thick, is completely machined in just 3.15 minutes f.t.f. time. Work is drilled through and a multi-diameter cutter rough-forms the bore from side A. The cycle stops and the part is reversed. The JETracer generates all bore surfaces shown in black, from side B. The bushing fit diameter is reamed and special holders with micro-tool adjustment rough- and finish-groove the face. The same size blind end cap is machined in a similar manner in 2.45 minutes f.t.f. The surfaces shown in black are traced.

***Bore diameters held within .0006" and 65 micro-inch RMS finish requirement easily met with JETracer, and rigid Fastermatic tooling. Tracing cuts time 25%, keeps tooling costs at a minimum.***




View from machine rear showing 4" square rod end cap in 2-jaw chuck. Note special adjustable holder with micro-adjustment to grooving tool. Machining of the groove and various bore diameters in one chucking assures concentricity and squareness.

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Printed in U.S.A.

**GISHOLT MACHINE COMPANY** Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines • Packaging Machines • Masterglas Molded Plastic Products

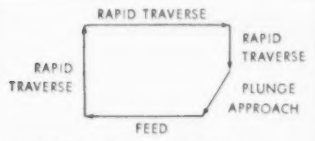
How to increase productivity with...

# Multicycle Hobbing

**Any one of these automatic cycles can be selected simply by turning a switch on the control panel.**

SQUARE CYCLE – automatic version of the conventional hobbing cycle.

PLUNGE CYCLE – automatic vertical feed for cutting worm gears.




PLUNGE-APPROACH CYCLE – combination of "plunge" and "square."

Automatic cycling plus the opportunity to greatly reduce approach time in many cases makes the Multicycle version of the Barber-Colman No. 16-16 Hobbing Machine a high-production machine, and yet it is extremely versatile.

### Reduce approach time

The new Multicycle machine offers three different automatic cycles (see sketch). Any of these can be selected simply by turning a switch. With the plunge-approach cycle for cutting helical gears and worms (or when using large, multiple-thread hobs), you can greatly reduce long approach time. With the push of a button, cam vertical feed and conventional horizontal feed cycle automatically. The hob starts cutting at full depth faster. Clamping and unclamping of the workslide is automatic. The operator just loads and unloads the work.

### Automatic machines can be versatile, too!

To cut worm gears, turn the selector switch to "plunge," disengage the feed change gears, turn the dial control to proper cam speed, set the vertical stops, and push the start button. The workslide lowers rapidly to the cutting position. The work feeds slowly to full depth as it is being hobbed, and then dwells for the desired number of revolutions. When the hob stops, the workslide returns to starting position.

### Is there a Multicycle machine for you?

You bet there is. These same features are available in the No. 6-10 machine. Additional equipment, such as differential gearing, accessory vertical feed cams, and even full automation, will adapt this precision hobbing machine to almost any job. Send us prints of your gears. We'll give you a complete report on the time saved by a Multicycle machine. Call your nearest Barber-Colman field office or the factory, WO 8-6833.

**Barber-Colman Company**

BARBER COLMAN

**51 Loomis Street, Rockford, Illinois**

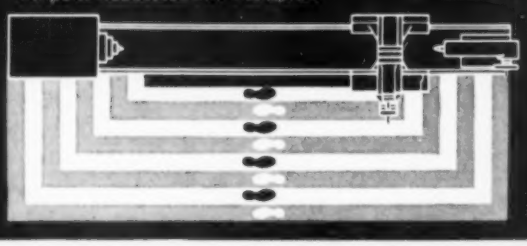
# Lodge & Shipley POWERSHIFT PRESELECTOR GIVES PRODUCTION PLUS

- **TIME SAVING** . . . by eliminating "compromise speed setting" which can waste up to 50% of machining time.
- **INCREASED TOOL LIFE** . . . by using proper cutting speed. You save both tool time and money.
- **FINER FINISH** . . . with the right cut speed greatly reduces grinding required.
- **DECREASED EFFORT & ERROR** . . . preselection of cutting speeds offers another saving in operator time and effort.
- **PROVISION FOR THE FUTURE** . . . POWERSHIFT can be adapted for electronic programming or magnetic tape control.

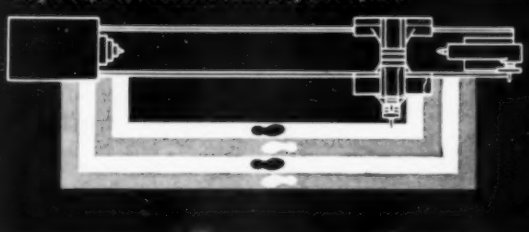
**A SINGLE DIAL . . . COMPUTES! REMEMBERS! SHIFTS!** You merely rotate cut speed dial to desired speed (dial computes speed if desired) . . . then, when preset speed is needed, shift to it immediately at the apron! One speed can be preset; up to six others "programmed" with handy indicator tabs. A Lodge & Shipley representative will be glad to explain fully. You'll find his name in the telephone yellow pages. Or, for detailed literature, write: **THE LODGE & SHIPLEY CO., 3056 COLERAIN AVE., CINCINNATI 25, OHIO**

With a long bed lathe and a job requiring 4 speed changes, an OPERATOR CAN SAVE ALMOST 50% OF HIS "HIKING TIME"

CONVENTIONAL HEADSTOCK . . .
4 trips to headstock . . . 4 to apron



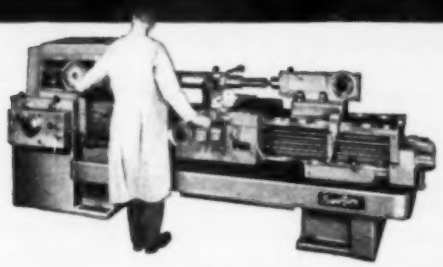
POWERSHIFT PRESELECTOR . . .
only 2 trips to headstock . . . only 2 to apron!

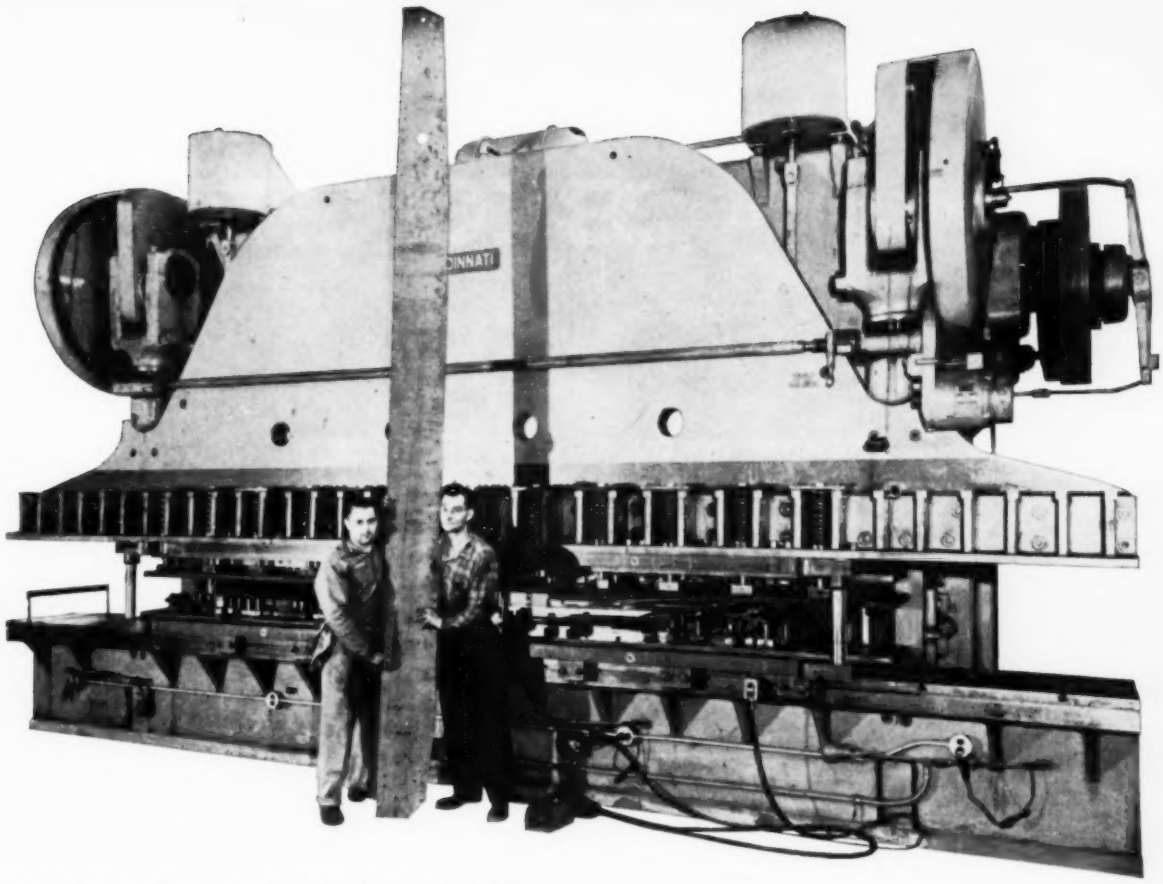


more than ever . . .

**Lodge & Shipley**

your LODGE-ical choice

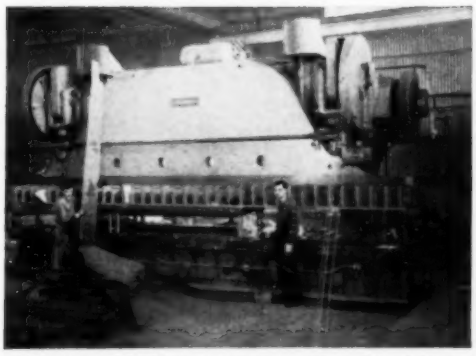




Punching floor-to-floor time cut from 36 to 1⅓ minutes.

*Photos courtesy Fort Wayne Structural Steel Co., Inc.*

# 70 minutes cut to 2.6 min.



Blanking floor-to-floor time cut from 34 to 1¼ minutes.

In combined blanking and punching operations, production time has been cut 96.2% on these long truck side rail reinforcements, thanks to the versatility of this Cincinnati® All-Steel Press Brake.

Operating data, furnished by John L. Hayner, President of Fort Wayne Structural Steel Co., Inc., show how his company slashed production costs so substantially.

They decreased floor-to-floor time from 34 minutes to 1¼ minutes on blanking ¼" C1010 Steel with a 202" cutting edge. By punching 130 holes per stroke, they reduced floor-to-floor time from 36 minutes to 1⅓ minutes.

Talk with our Application Engineering department about applying a time-cutting Cincinnati Press Brake in your shop. It can be the most profitable decision you've made this year. Write Department A for Press Brake catalog.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

# What is the BIGGEST

**Here's LeBlond rigidity** in action at Alliance Tool & Die Corp., Rochester, N. Y. The part is a 6500 lb. molybdenum steel compressor wheel, 32 micro finish and ± .001", minus .000" critical tolerance on bore, recess and hub!

# workpiece your lathes can turn?

Probably your lathes will swing a 32″ piece. Or 40″. But what happens when that occasional 50″ or 60″ job comes along? Chances are you have to say, "We can't handle it. After all, how can you justify a big swing lathe, just for a few big jobs a year?"

Today there *is* a practical and economical solution to this odd-size work problem. LeBlond Sliding Bed Gap Lathes.

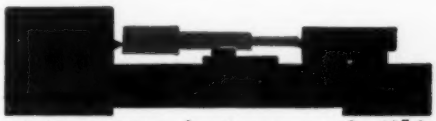
Our 32″/60″ Heavy Duty will accommodate work up to 60″ diameter! Basically this is a 32″ lathe. But it has an extendible bed (an upper bed that slides on a lower bed). Slide it to the right, and a gap opens. Now, you have a full 60″ swing! Also, for extra long work, there is 50% greater center distance. And the rest of the time you have a regular 32″ heavy duty lathe for a wide variety of work.

3 lathes in one—at the cost of a lathe and a half!

Here's an example of how this extra capacity pays off. Alliance Tool and Die Corp., Rochester, N. Y. are specialists in unusual machining problems, like precision molds—and the bulky compressor wheel, shown here. How did they turn it before? They didn't. The part was too big. Now, with their 32″/60″ LeBlond (recommended by Macaulay Machinery Co., Rochester, N. Y.,) they take jobs like this right in stride. Actually, this particular order was made possible by this lathe.

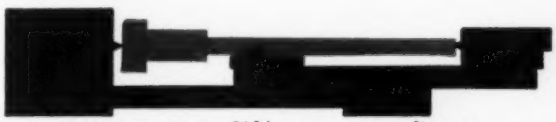
If you do job shop work, you can consider this lathe a business-getter. If you're doing your own maintenance, it gives you the capacity to do virtually all your own turning work. LeBlond Sliding Bed Gap Lathes are available in 4 sizes—16″/38″, 25″/50″ and 32″/60″ (shown) Heavy Duties and the 17″/28″ Regal. You're sure of getting the right lathe for your job when you buy LeBlond. There are 76 lathe models to choose from. Call your LeBlond Distributor or write.

**Here's how the LeBlond Sliding Bed Gap Lathe gives you extra capacity for extra large work:**



BED GAP CLOSED—*functions as a regular 32″ lathe.*

BED GAP OPEN—*full 60″ swing.*



BED FULLY EXTENDED—*50% greater center distance.*

*. . . cut with confidence*

**THE R. K. LEBLOND MACHINE TOOL COMPANY**
*Cincinnati 8, Ohio*

LEBLOND of Cincinnati

*World's Largest Builder of a Complete Line of Lathes for More than 71 Years*

◄ CIRCLE 206 READER SERVICE CARD

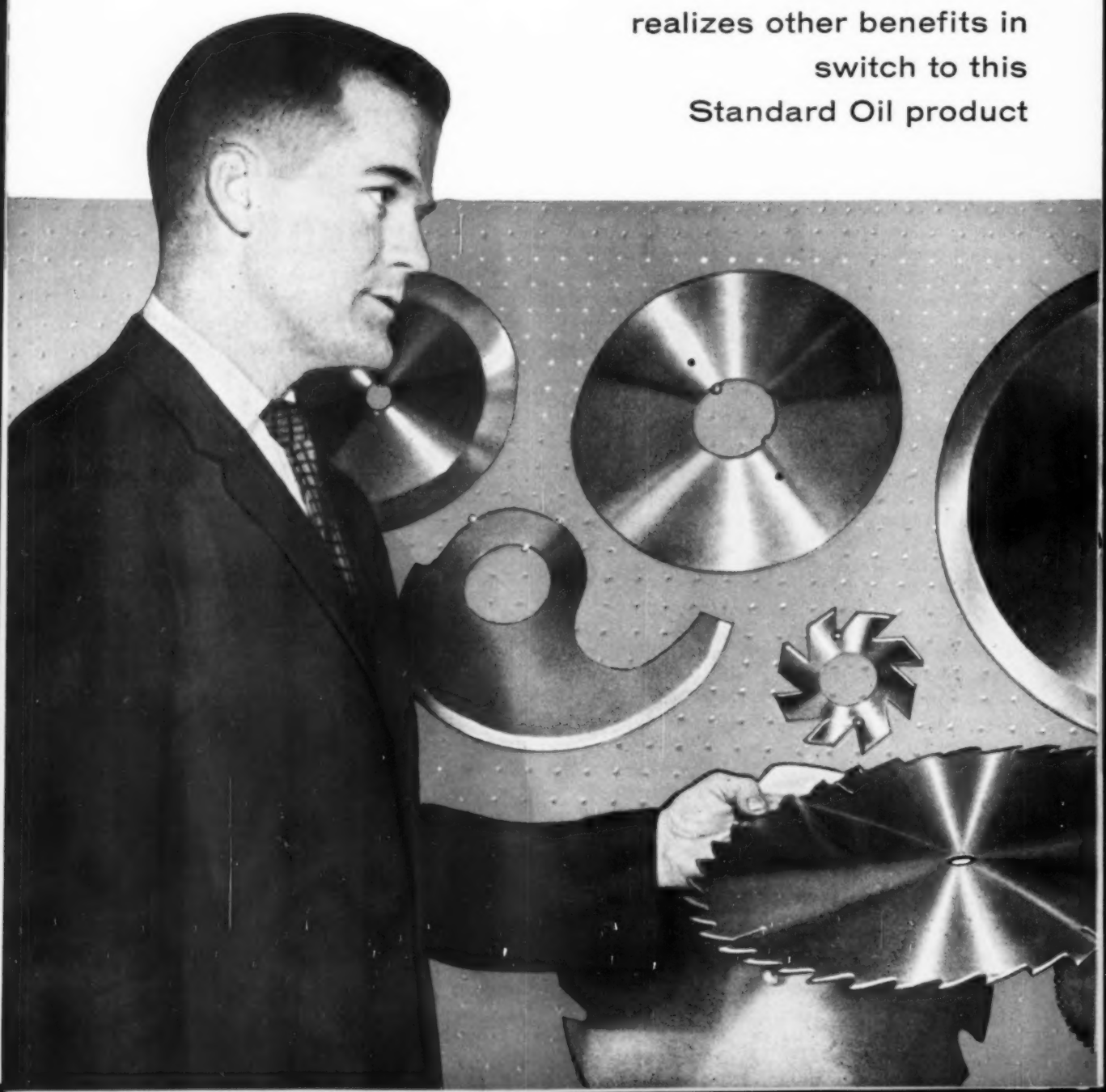
CIRCLE 207 READER SERVICE CARD

*Gets 40% savings in coolant costs by change to*

# Standard's Transparent Coolant

**ARGON Oil No. 4**

Chicago Saws, Inc., realizes other benefits in switch to this Standard Oil product



**Situation:** It all started when a Standard Oil lubrication specialist recommended ARGON Oil No. 4, Standard's transparent coolant to Chicago Saws for use in their grinding operations. This manufacturer of rotary saw blades decided to give it a try. They knew the product was the result of more than three years' work in Standard's research laboratory, and that it had been extensively field tested.

**What happened:** Using ARGON Oil No. 4 in 100:1 concentration, Chicago Saws was able to reduce coolant costs 40%. They also found the work could be seen more clearly when using this coolant. There was less wheel loading. They also discovered the coolant didn't foam and that its exceptional ability to carry off heat resulted in cooler operation. Faster cuts were obtained with finer wheels. Tolerances were easier to hold. Better finishes were obtained. Wheel dressings were less frequent.

**What you can do:** Get more information about ARGON Oil No. 4 transparent coolant. Call the Standard Oil lubrication specialist near you in any of the 15 Midwest or Rocky Mountain states. Or write: **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.**

Using ARGON Oil No. 4, Chicago Saws gets better finish at savings of 40% over other coolants tried. Operator is using .004" cut on heat treated Rockwell 60 C steel.

*You expect more from* **STANDARD** *and you get it!*

*Quick facts about*

**Standard's Transparent Coolant**

**ARGON Oil No. 4**

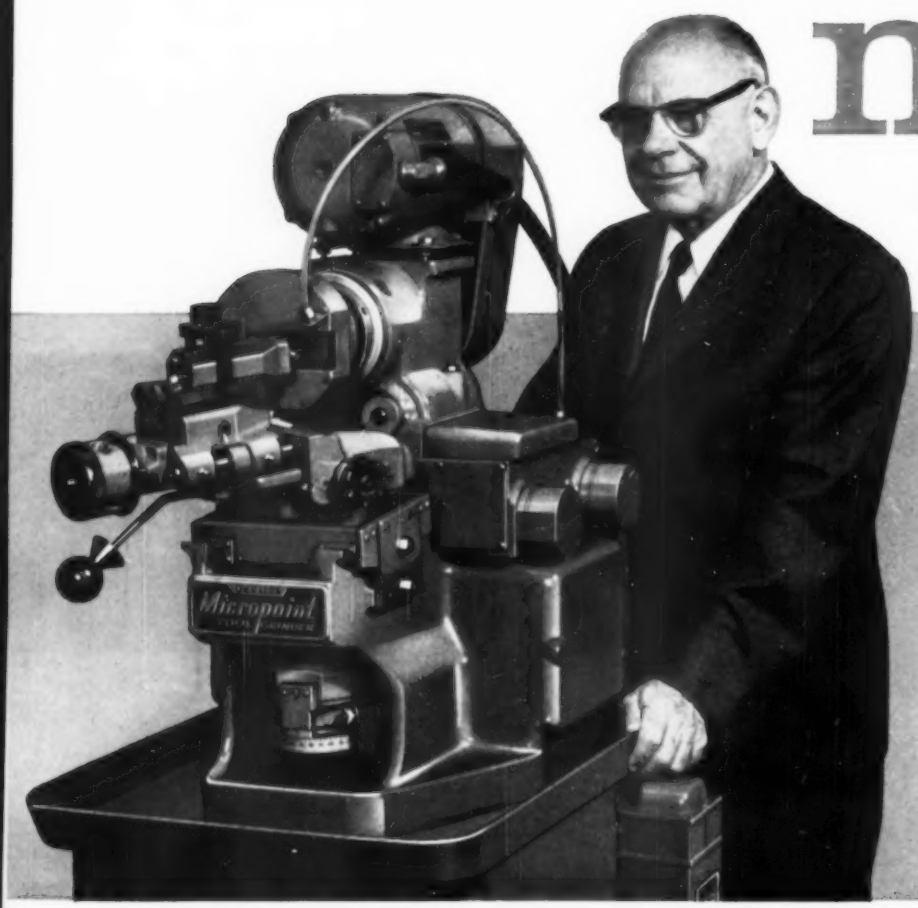
- Clear, transparent fluid
- All chemical. Does not support bacteria growth
- Unaffected by humidity
- Nonfoaming
- Fire resistant
- Odorless

Standard's Bob Stark and Chicago Saws' vice president Paul Bostrom discuss blades and coolants. Bob Stark is well qualified to work with manufacturers on the use of metalworking coolants. Bob has a chemistry degree from Illinois College plus three years' experience at Standard. He has completed the Standard Oil Sales Engineering School course.

## NEW FROM FAIR STREET • HOME OF THE JIGMIL

# mic

## the first grinder




**"Micropoint is the first machine in its field able to grind tool profiles geometrically correct to gage room accuracy"**

"MICROPOINT is not just another grinder. It's a precision machine that makes possible a new technique of single point tool grinding. Advantages of this new technique include greater cutting tool life, increased accuracy and output of machine tools and greatly improved uniformity and finish of the end product. Originally developed for our own use, MICROPOINT became necessary in our continuing pursuit of accuracy."

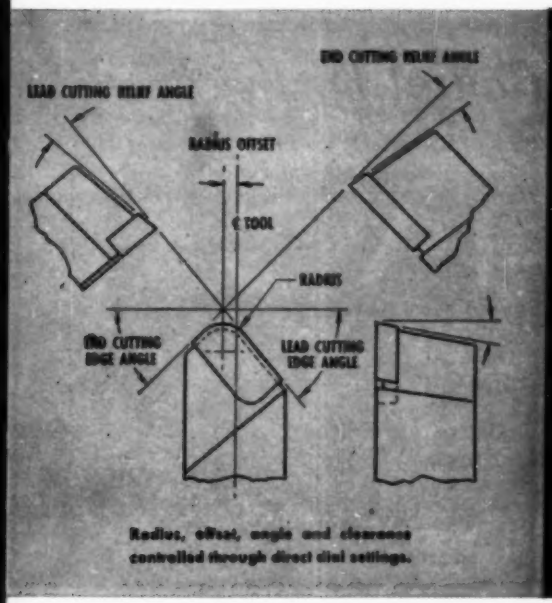
**C. B. DE VLIEG**

**DE VLIEG MACHINE COMPANY, FAIR STREET • ROYAL OAK, MICHIGAN**

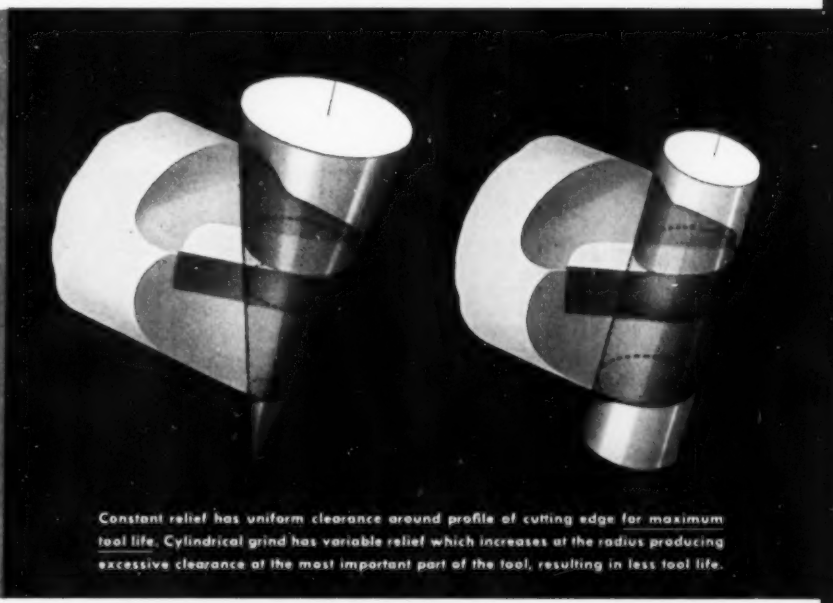
CIRCLE 210 READER SERVICE CARD

# ropoint®

## capable of absolute control of tool geometry




Radius, offset, angle and clearance controlled through direct dial settings.



Constant relief has uniform clearance around profile of cutting edge for maximum tool life. Cylindrical grind has variable relief which increases at the radius producing excessive clearance at the most important part of the tool, resulting in less tool life.

**DIRECT DIAL SETTINGS** reduce the possibility of human error and provide a method of fast, simple, accurate adjustment for each radius, angle, offset and clearance in exact accordance with the geometric requirements of the tool. With a minimum of operator training, tool profiles can be controlled to .0001". Set-ups can be made quickly and with precise accuracy. Operators have ground as many as 300 identical tools in one set-up without corrective adjustment. Because of the machine's unique design, diamond wheel cutting life has been increased 4 to 6 times. Field tested for three years, many MICROPOINT grinders are already in use throughout industry. Available from your DeVlieg distributor.

Write for Micropoint Tool Grinder Catalog

REWARDING REVELATIONS IN PRECISION
AWAIT YOUR VISIT TO FAIR STREET

# DeVlieg

## MICROPOINT® TOOL GRINDER

Geometrically correct tool points ground to gage room accuracy!

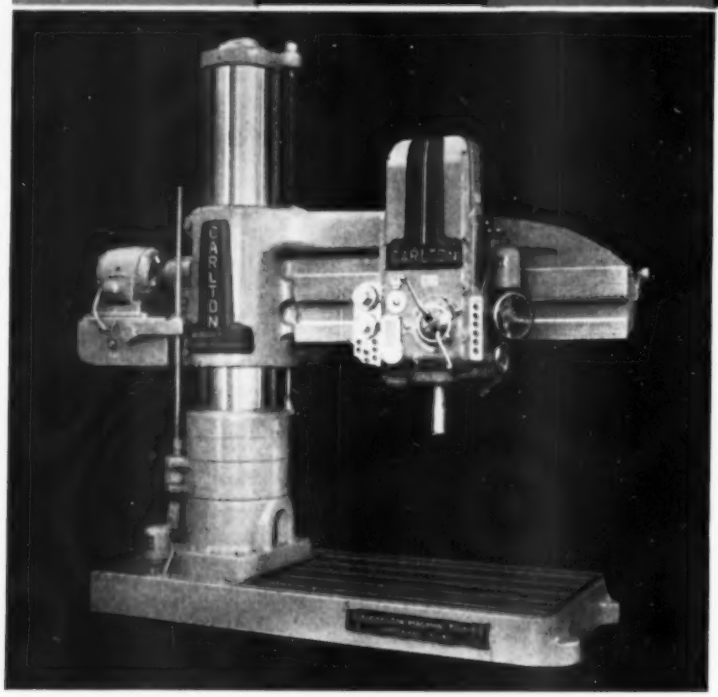
CIRCLE 211 READER SERVICE CARD

| Model | Column diameters | Arm lengths | Speeds No. | Speeds Range | Feeds No. | Feeds Range | Motor recommended |
|---|---|---|---|---|---|---|---|
| 0A | 9" | 3'-4' | 9 | 20 to 1 | 4 | .005-.020 | 3-hp |
| 1A | 9"<br>11" | 3'-4'<br>3'-4'-5' | 12 | 25 to 1 | 6 | .006-.025 | 5-hp<br>5 or 7½-hp |
| 3A | 13"<br>15"<br>17" | 4'-5'<br>4'-5'-6'<br>5'-6'-7' | 36 | 100 to 1 | 18 | .004-.125" | 7½, 10, 15, 20 or 25-hp |
| 4A | 19" | 6'-7'-8' | 36 | 100 to 1 | 18 | .004-.125" | 15 to 40-hp |
| 5A | 22"<br>26" | 7' to 10'<br>8' to 12' | 36 | 100 to 1 | 18 | .004-.125" | 20 to 40-hp† |

*8, 11½, 14 and 18 threads per inch are standard, with various other combinations available.
† Driving motor larger than 40 hp can be used if desired.

# *Carlton... Specialists in Radial Drills*

## 0A 1A 3A 4A 5A




Carlton is the **only** radial drill to bring you all these advantages:

- Low-hung drive to spindle
- All ball bearing construction
- Independent electric power for spindle and all auxiliary components
- Pushbutton control
- 3-unit power clamping
- Precision column clamping

Carlton also offers the widest choice:

- 5 different models
- Column diameters from 9" to 26"; arm lengths from 3-ft to 12-ft.
- 5 different types of speed-feed controls (on 3A, 4A and 5A)

Write today for descriptive bulletins. The Carlton Machine Tool Co., Cincinnati 25, Ohio

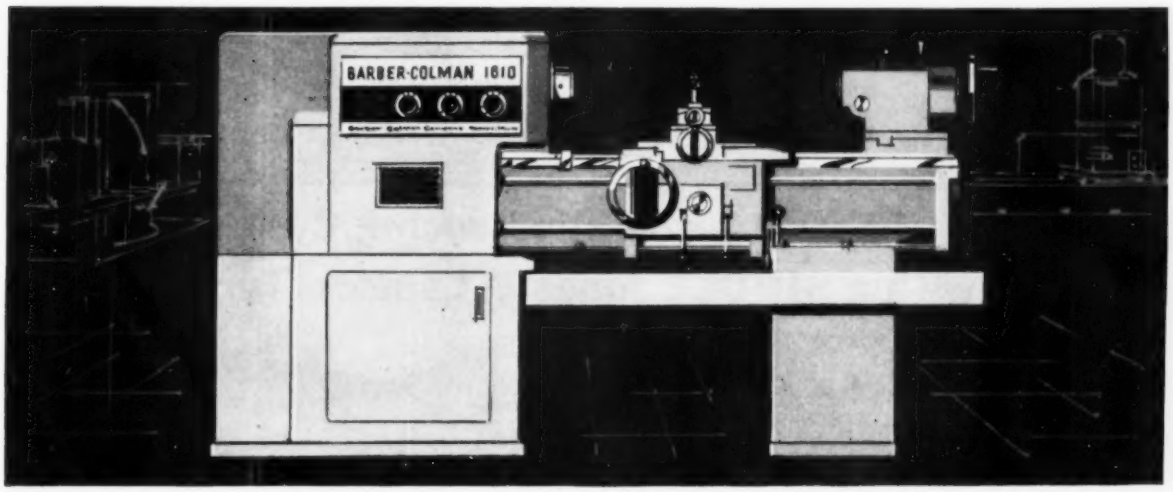
# Carlton *Specialists in radial drills*

# New Facing and Turning Lathe

**For straight turning and facing: the new Barber-Colman No. 1610 FT Lathe is a more practical buy for those who want speed and precision at a saving.**

A high percentage of lathes equipped with threading features are used exclusively for turning and facing. What's more, many long-run turning jobs require toolroom accuracies nowadays. So, why pay a premium for threading when you can buy a rugged, high-speed lathe that is a "cut above" other machines in the same price range?

Generally, there are only two kinds of lathes designed especially for turning and facing. Those with a belt drive (like our 1610 FT) and those with a geared head. Now, a geared head lathe is fine. We make lots of them. But, for fast, fine-finish turning, most people prefer a belt drive — and it's exceptionally quiet. (For heavy cuts at low speeds, a back gear reduction of 4.4:1 is available as extra equipment.)




### Infinitely variable speeds and feeds

The 1610 FT is powered by a timing belt drive from a 6.5 horsepower variable speed motor. We can furnish 1500, 2000, or 2500 rpm maximum spindle speed to put you in the carbide-ceramic ranges. Like our No. 2-E, this new facing and turning lathe changes speeds "on the fly" . . . with the tool in the cut, by the turn of a dial on the headstock.

For consistent accuracy and long tool life, you'll want an easy, practical method of adjusting feed. Power feed to both carriage and cross slide is infinitely variable from .079″ to 24″ per minute. There are no feed gears to shift — just an easy-to-turn dial on the headstock. Depending on the spindle speed, feeds from .00003″ to .482″ per revolution of the spindle are possible. For tracer work or large facing cuts, a constant sfm control is available as extra equipment.

### A few words about quality and price . . .

The new No. 1610 FT is not a stripped-down model but a lathe designed to meet modern toolroom and production methods. A sizable reduction in price over a standard lathe results from having designed a lathe specifically for turning, facing, and boring. It's a precision machine (with the same toolroom "feel") as all Barber-Colman toolroom lathes . . . a machine any owner will tell you is the outstanding value in its class. The completely ground spindle is mounted on precision tapered roller bearings, equipped with automatic thermal compensation to maintain a constant bearing load. Automatic feed stops and a positive micrometer stop are standard. There's a spindle speed tachometer on the headstock, and a counter on the tailstock to indicate quill travel to .001″. Difficult-to-read scales have been eliminated. All dials on the carriage and compound are direct reading. Dynamic brake is fast, yet smooth for heavy workpieces. It has no moving parts.

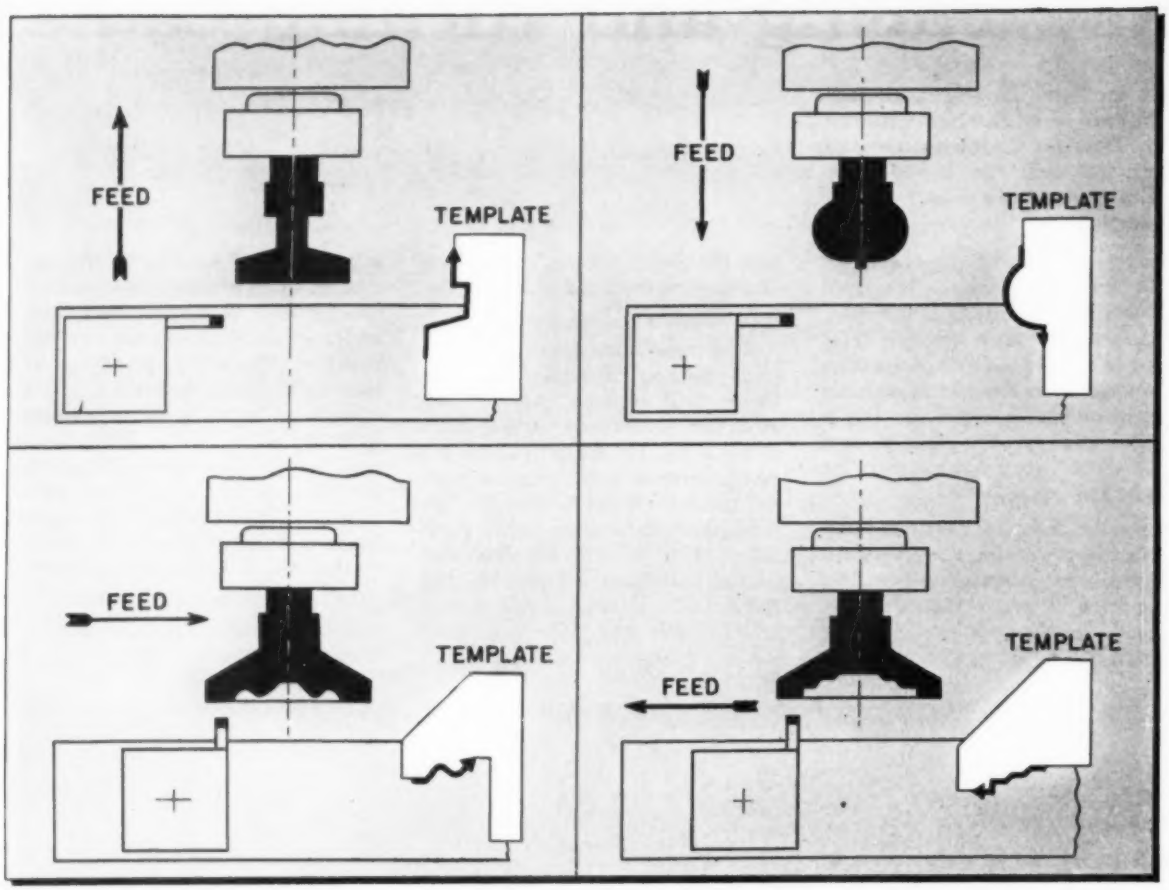
### Other features available . . .

Ask your Barber-Colman representative or dealer for complete facts and features on this new, practical kind of lathe. It may be just what you need for your turning and facing requirements.

**Barber-Colman Company**

BARBER COLMAN

57 Loomis Street, Rockford, Illinois




# ALL FOUR of these Automatic Tracing Cycles are available with a SINGLE Jones & Lamson Turret Lathe

**the man who needs a new machine tool is already paying for it**

How's this for machine flexibility in one chucking? (1) You get all of the accuracy and tooling combinations offered by the standard J & L Turret Lathe. (2) You have more than 180° of tool travel control in each of four different automatic tracing cycles (you don't *have* to have *all* four, incidentally). (3) You do both rough and finish tracing (*with rough and finish tools*) in the same set-up. (4) You multiple-tool your tracing operations through 180° of tool control. (5) You have complete control for diameter with the conventional graduated hand wheel on either mechanical or *tracing* operations. (6) The original full swing of the Turret Lathe is retained with this tracer. (7) A single lever disconnects the tracer for standard turret lathe operation.

Such flexibility enables you to perform an amazing amount and variety of work with this new *Two-Dimensional Tracer* on J & L Saddle Type Turret Lathes.

It all adds up to: MAXIMUM WORK COMPLETED IN ONE CHUCKING; REDUCED HANDLING TIME; INCREASED ACCURACY. Write for further information.

**JONES & LAMSON** Machine Company • Dept. 710, 502 Clinton St., Springfield, Vt.

*Turret Lathes · Automatic Lathes · Tape Controlled Machines · Thread & Form Grinders · Optical Comparators · Thread Tools*

"Three times better!"
"Latest Cimcool Success Story!
Nation's best-selling chemical
cutting fluid scores again!"
SALES REPORT
2.
and this company* had been
using a good grade soluble oil
at 1:20 for machining steel.
But rancidity was making them
change the coolant every week.
So they put in Cimcool at a
1:40 dilution. That was three weeks ago.
And still not a sign of rancidity!
CIMCOOL has saved them money,
and kept production going.
Their grinding room foreman also wants
Cimcool because it has already
increased cutting fluid life three times!
Bud Hume
Detroit Office
* Name of this construction machinery manufacturer on request

FOR 100% OF ALL METAL CUTTING JOBS

***Production-proved products of The Cincinnati Milling Machine Co.***

**CIMPERIAL**—*newest* in the famous, industry-proven line of CIMCOOL® Cutting Fluids!
**CIMCOOL 52 Concentrate**—The pink fluid which covers 85% of all metal cutting jobs.
**CIMPLUS**—The transparent grinding fluid which provides exceptional rust control.
**CIMCUT Concentrates (AA, NC, 55)**—For every job requiring an oil-base cutting fluid.
**ALSO—CIMCOOL Tapping Compound—CIMCOOL Bactericide—CIMCOOL Machine Cleaner.**

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, O.

®Trade Mark Reg. U.S.Pat. Off.

**ALL SET**

**for more and better**

**cuts per dollar!**

# Heller

"Job Tempered"

## Hack Saw Blades

Heller nucut
HIGH SPEED NUWELD
12" x1".050-10T

Heller nucut High Speed "M"-HAX
12"-14T All Hard

**UNIFORMITY PAYS OFF!** Uniform set gives the teeth of every Heller blade the clearance needed for straight, fast cutting. Uniform shape, spacing and height of teeth distribute wear evenly and lengthen life. Uniform temper over the full length of every blade adds extra resistance against stresses and strains.

**TEST THEM YOURSELF!** You'll find that Heller's certified uniformity within each blade and from blade to blade adds up to superior cutting at lower costs. Your nearby Heller distributor has a complete line of Heller Hack Saw Blades . . . 3 types for power use . . . 3 types for hand use . . . in all standard specifications. So, he can help you select the right blade for any job.

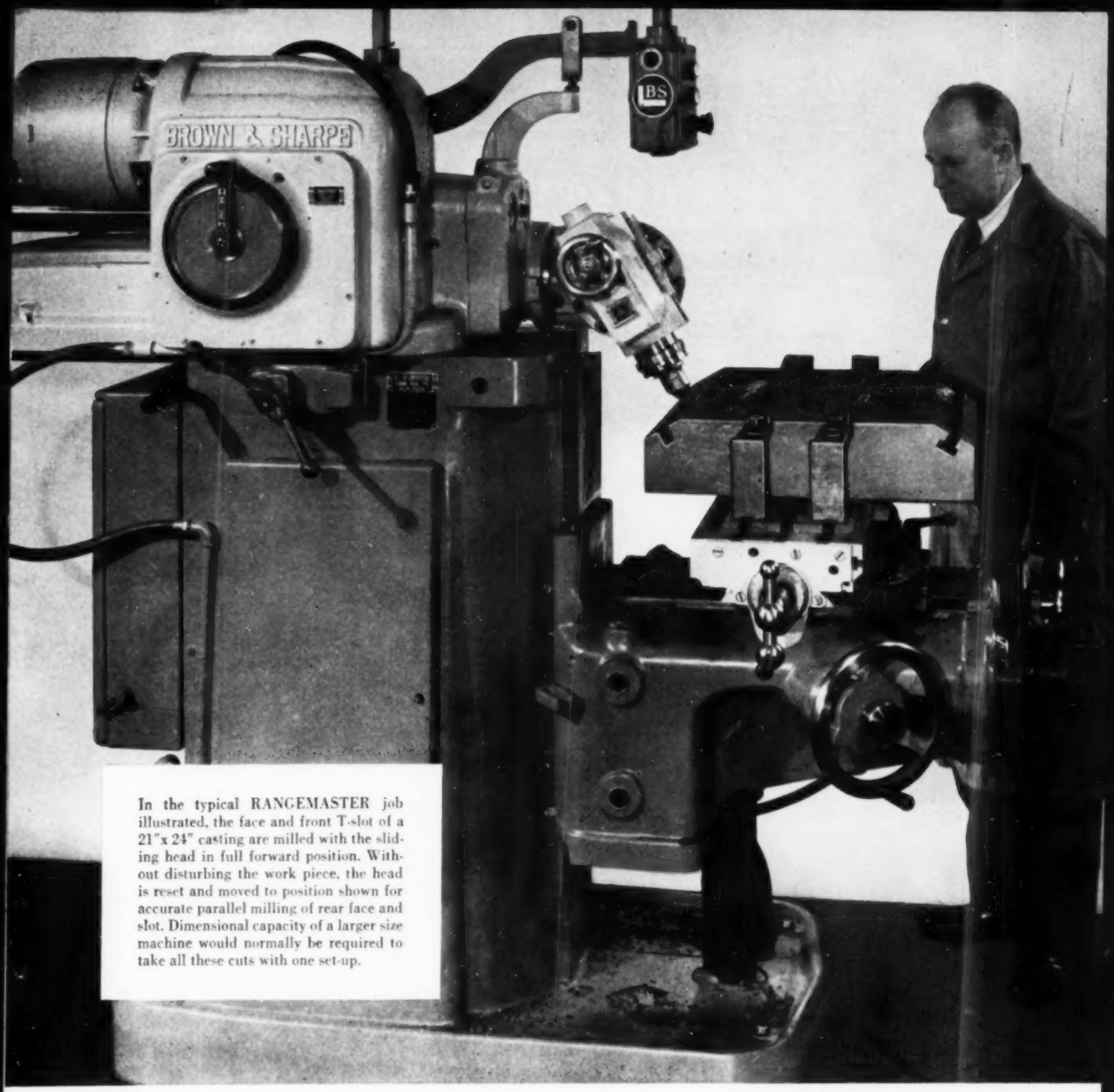
CALL YOUR LOCAL DISTRIBUTOR
Heller for Heller
SERVICE • STOCKS • SAVINGS

HELLER TOOL CO.

HELLER TOOL CO. SINCE 1836

America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO
Subsidiary of Simonds Saw and Steel Co.

Branch Offices and Warehouses: Newark, N. J. • Detroit • Chicago • Shreveport • Los Angeles • Portland, Oregon



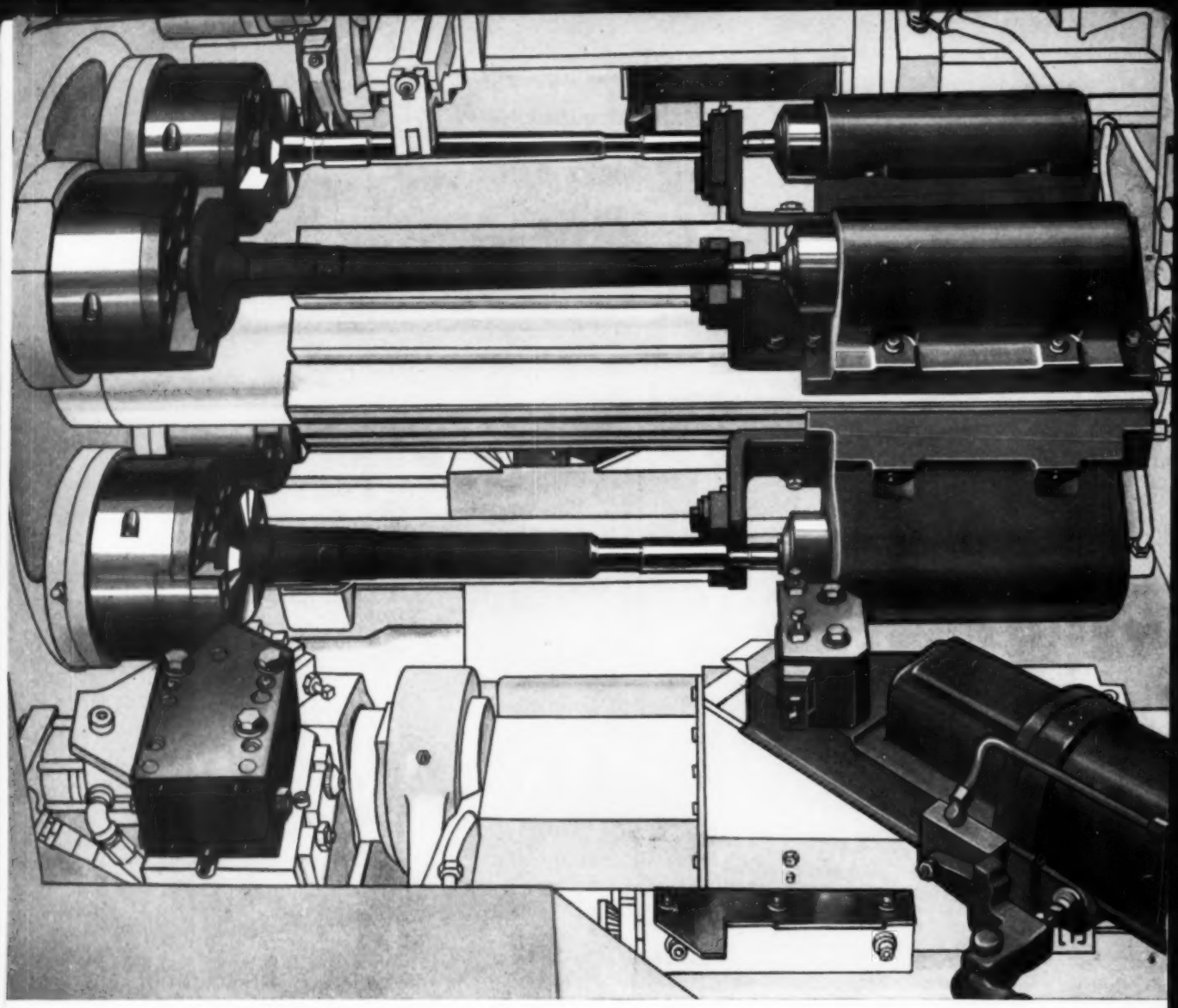

In the typical RANGEMASTER job illustrated, the face and front T-slot of a 21"x 24" casting are milled with the sliding head in full forward position. Without disturbing the work piece, the head is reset and moved to position shown for accurate parallel milling of rear face and slot. Dimensional capacity of a larger size machine would normally be required to take all these cuts with one set-up.

# "All-around" milling with one set-up

## ... the Brown & Sharpe RANGEMASTER®

The Brown & Sharpe RANGEMASTER provides the biggest work capacity in its class. It saves you the extra cost of a bigger machine — saves still more on set-up and tooling costs. You get all ram-type machine advantages, *plus* the full metal-removing ability of a conventional knee-type machine of equivalent size. For toolroom, experimental, and prototype jobs — for "all-around" milling, it's by far your best investment. Universal or Plain. For details, write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I.

**Brown & Sharpe** PRECISION CENTER



# **idea** *for volume producers of shafts*

Economists are making startling predictions on this year's increase in productivity. They say it will be twice that of recent years – up as high as 10% in some manufacturing industries.

Whether or not these predictions come to pass, it's certain that it won't happen in plants using outdated equipment.

Shaft work is a problem to many firms. New Britain pioneered template-controlled contour turning and boring, solving the problem for many progressive companies. Now for the manufacturer with really high volume requirements we present Model 412/25–a four-spindle, template-controlled machine capable of producing a four-fold increase in productivity per man hour.

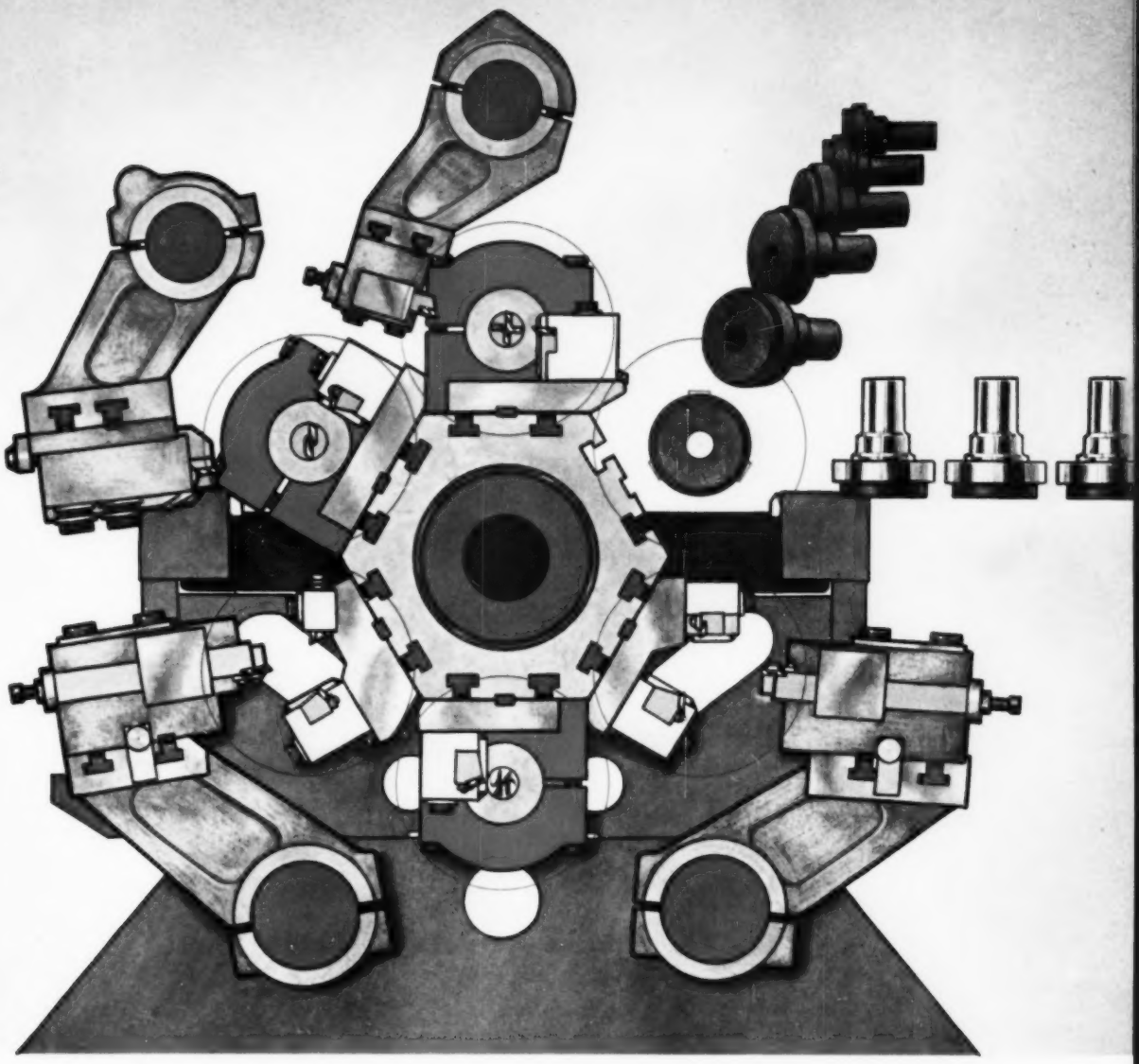
The basic principle pretty much speaks for itself. As in the case of the single-spindle contour lathe, inexpensive metal templates control the full cycle and re-cycle if required. Simple, single-point tools replace complex gang tooling. Set-up is simple and fast. When tools wear, merely replace them. Since all relationships are maintained by the template, tool replacement involves no problem.

When the volume of contour turning warrants it, this machine can be the best money maker on the production floor. Your New Britain representative can quickly tell you after looking at your prints and learning of your production requirements. Meanwhile, we would be glad to mail you descriptive literature containing the basic facts and specifications. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



CIRCLE 218 READER SERVICE CARD

CIRCLE 219 READER SERVICE CARD ►



# **two** *approaches to the depreciation problem*

Until there is relief in the form of a more liberal tax depreciation policy, there's only one way to avoid the pinch of a shop full of over-age machines you can't afford to replace: *Buy machines that will stay new.*

If you are a user of New Britain chuckers you have seen their basic principles continue to stand as the most advanced design available, year in and year out.

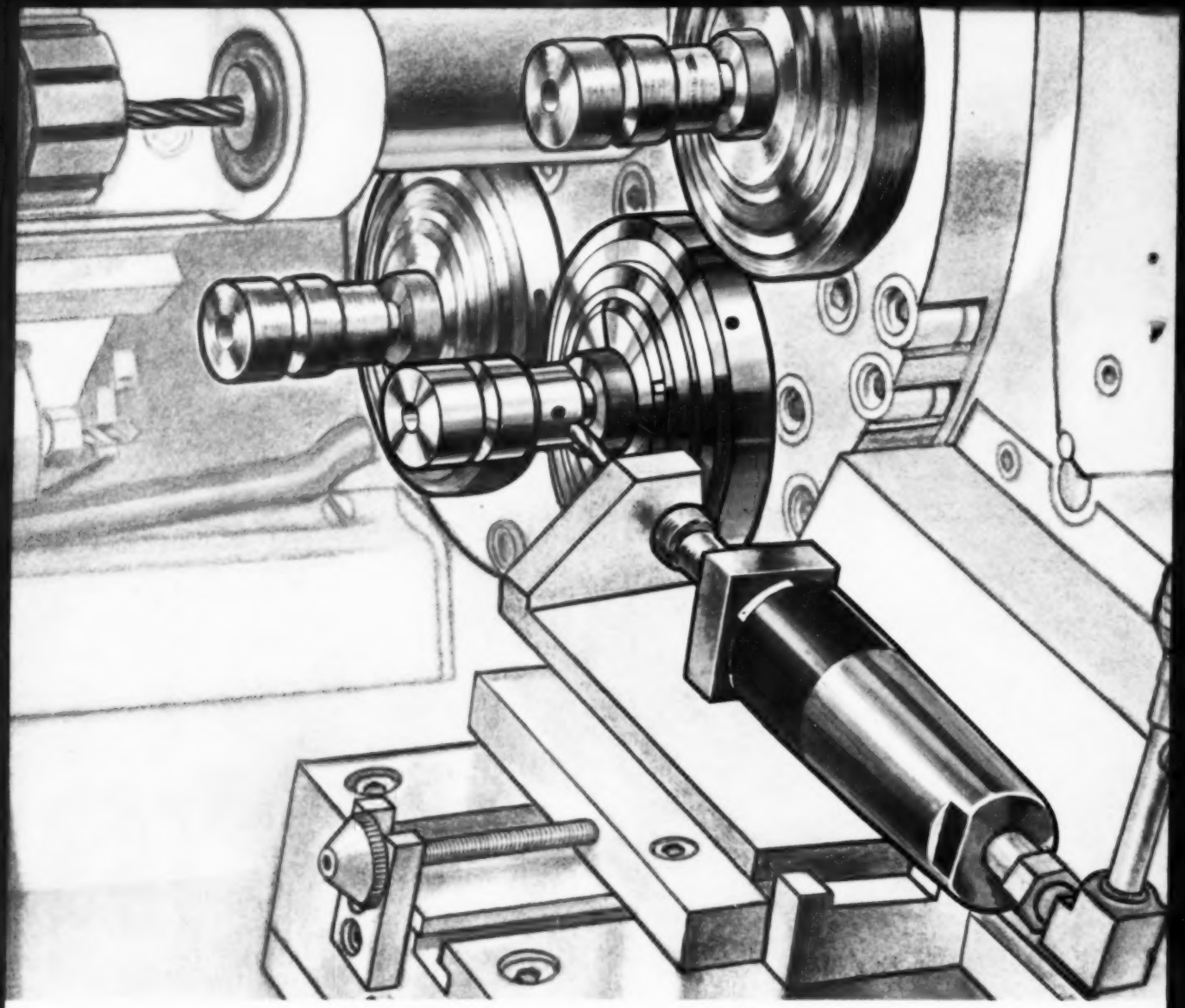
What value do you place on lifetime machine accuracy? The spindle carrier is the heart of a chucking machine. On a New Britain the carrier is lifted during index so it can't wear—then positively clamped to the frame during the cutting cycle for accurate cutting.

Interested in heavy facing and forming cuts? The long established New Britain swinging forming arm feature remains the best answer.

Want maximum clearance for fast and easy tooling, adjustment, and chip removal? Only New Britains are built with open end construction.

Today's New Britain chuckers provide the spindle speeds and power to take advantage of the most modern cutting tools. Optional tooling equipment includes drill speeders and attachments for reversing and non-reversing threading, recessing and accelerated reaming.

A new catalog describes the full New Britain line of 4-, 6- and 8-spindle, open-end, chucking machines. Fully illustrated in color, showing actual jobs, it may well suggest ideas for doing your work. Write for your copy. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



# *1960 productivity* **now**

If you have a voice in the purchase of machine tools you have probably begun to think in terms of what will be on exhibit at next year's Machine Tool Show.

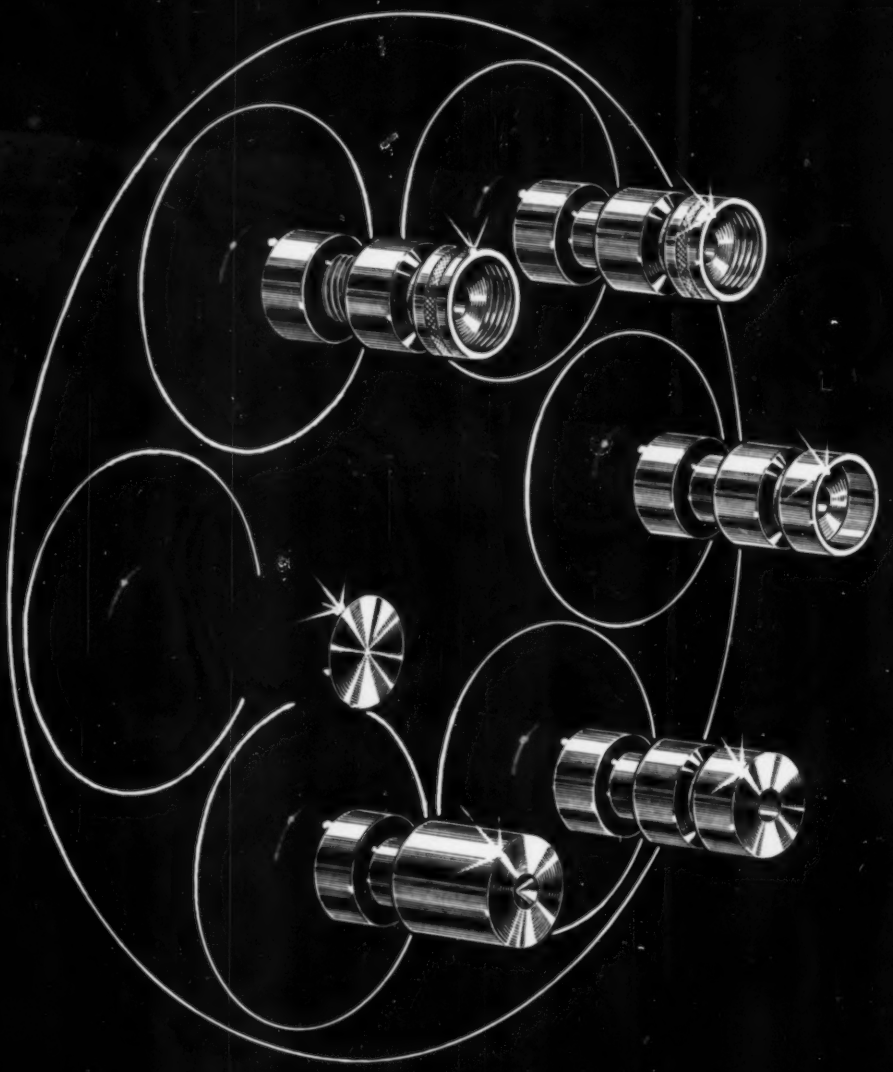
As far as multiple spindle bar work is concerned, you can see and buy and profit from the "show year" developments of New Britains a year ahead of time.

More operations, more pieces per hour, at closer tolerances has been the demand for years. Now New Britain has brought out a complete new line of bar machines that gives these words a brand new meaning.

Take the new Model 45 4-spindle series. The spindle capacity of 3" puts much larger pieces within automatic high-speed bar machine production range. Cross slides in all positions greatly increase the number and variety of cuts possible on four spindles. Spindle speeds up to 526 RPM provide for the use of the latest cutting tools. At the other extreme is a new line of 8-spindle machines. As you would expect with New Britain's radial independent cross slides, you can apply a tremendous number of tools and attachments to get very high production on really complex pieces. Or, with a double indexing set-up, you can turn out pieces, even pretty complex ones, at an all-time high rate per hour.

Six-spindle machines are everybody's work horses and New Britain offers the Model 52 in the 1¼" range, and the Model 62 with 2¼" capacity. These machines allow you to use a greater number and variety of tools on them without sacrificing accessibility. They can be tooled quickly and you can get at the tools for changes or adjustments with ease.

We can only suggest here some of the "show year improvements" in a greatly expanded line of New Britain bar machines. Your New Britain representative will be glad to arrange for a demonstration, and secure performance data based on your prints. If you would like to look over a catalog first, we'll be glad to send you complete descriptive literature. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Conn.



# *3½"—More* **capacity** *than ever in a New Britain*

**Model 82 • Six Spindles • 3½" Capacity • All New**

Here is a *brand new* New Britain . . . the most modern large capacity bar machine available. The Model 82 brings to the 3½" size range all the versatility and exclusive New Britain features previously available only on smaller models. Designed from the ground up for large capacity work, the Model 82 is the only 6-spindle machine on the market that offers a really up-to-date replacement for the older, slower methods currently used for this size range.

Each of the six spindles on the Model 82 has an independent, cam-operated cross slide. These cross slides combined with the end-working tool slide allow practically unlimited tooling combinations.

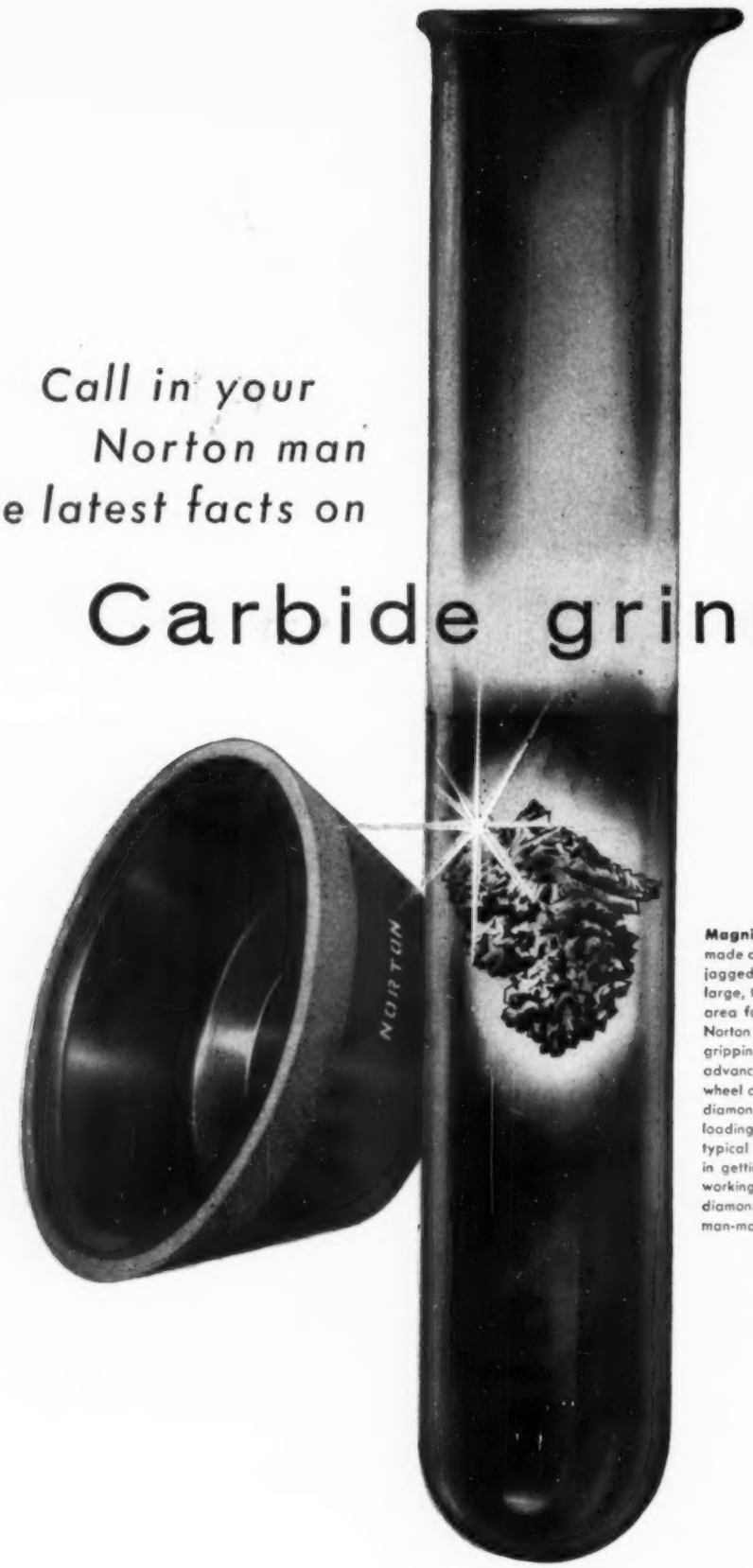
The Model 82, like all New Britain Bar Machines, has a special lifting and locating mechanism which prevents wear on the spindle carrier. Rigid locking of the carrier to the massive frame during the cutting cycle eliminates vibration.

The power, massiveness, speed range, accuracy, ease of changeover, coolant capacity and every other feature designed into the Model 82 makes this the right machine for high-precision, high-production, large-capacity bar work.

Why not investigate the possibilities the Model 82 offers in your plant? When you get right down to it, it's the first chance you've had in a long time to update production in an area that needs it badly. Complete catalog material is available on the whole range of New Britain Six Spindle Bar Machines. For your copy, write to The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Conn.

*Call in your Norton man for the latest facts on*

# Carbide grinding




**Magnified View** of a man-made diamond. The extremely jagged surface provides a large, tight-holding contact area for bonding. In the new Norton SD wheels this extra gripping power, teamed with advancements in diamond wheel construction, reduces diamond loss and carbide loading to a minimum — typical of Norton leadership in getting the maximum working power out of all diamonds, mined or man-made.

# with Norton wheels

## *using mined or man-made diamonds*

Norton diamond wheels — the most complete line for carbide grinding — are backed by pioneering never equalled, whether the diamonds used are mined or man-made.

Norton began its leadership in diamond wheel development back in 1930 . . . introduced all three bond types (resinoid, metal and vitrified) of diamond wheels . . . does all its own sizing and checking of diamonds . . . duplicates wheel specifications with constant accuracy.

Today Norton leadership continues with the use of man-made diamonds. Among the newest, most efficient materials produced for industry, man-made diamonds last longer in grinding wheels for many carbide grinding operations because they are more firmly anchored in the bond . . . and because their greater friability presents new cutting edges faster, thereby decreasing power requirements and speeding cutting action.

These properties of man-made diamonds are used to their fullest advantages in the new Norton SD resinoid and vitrified wheels. This has been proved in more than a year of nation-wide, comparative testing . . . *In 63% of hundreds of field tests the average service life of Norton SD diamond wheels was at least 25% longer than the life of wheels using natural, mined diamonds, with no loss in cutting action.*

With each Norton diamond wheel, of mined or man-made diamonds, you get a certificate of the accuracy of diamond concentration. You can depend on this certificate to mean exactly what it says and what you're paying for.

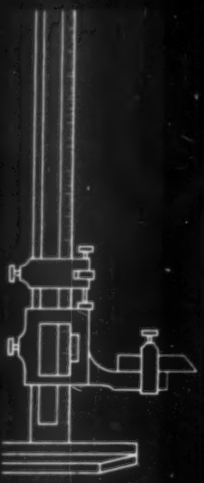
You can depend on your Norton Man, too. This expert Abrasive Engineer has kept close contact with the development of man-made diamonds for grinding applications since the start. He can help you take a giant step forward in your carbide grinding — can show you how to get better grinding quality, longer service life and lower cost grinding for every dollar you spend on diamond wheels. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

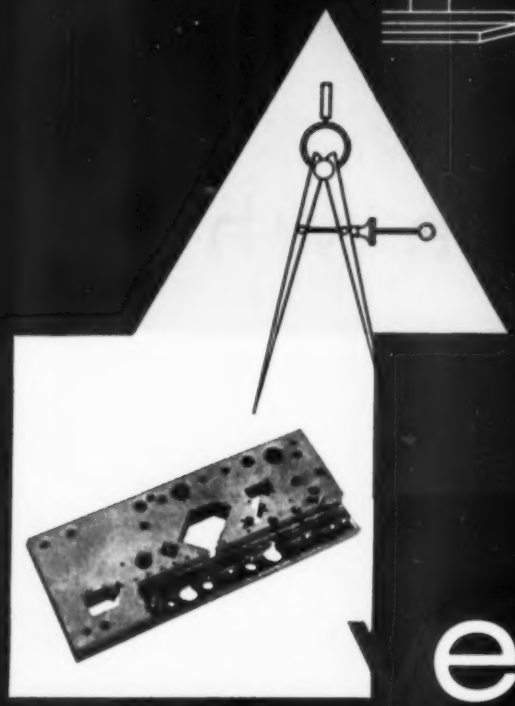
NORTON
ABRASIVES

**Making better products . . . to make your products better**

W-1915

**NORTON PRODUCTS:** Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

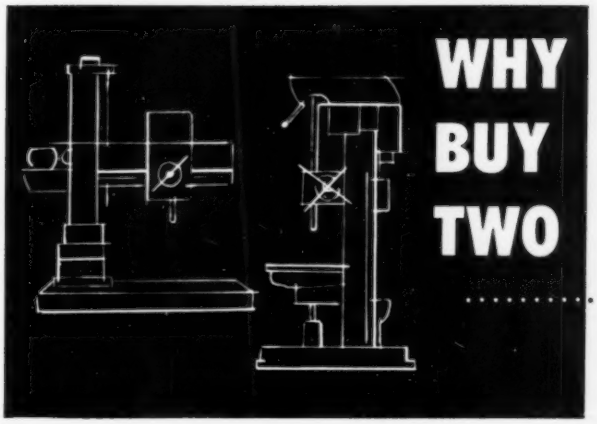




# eg

air hardening tool and die steel offers safety in hardening unmatched in the industry. Even intricate dies with many cutouts, sharp corners and thin sections come through heat treatment with outstanding freedom from warpage and size change. VEGA is a tough steel specially developed by Carpenter to combine the machining properties of an oil hardening grade with the safety in hardening of an air hardening steel. On job after job, VEGA has outperformed any other grade ever tried! Order today from your nearby Carpenter SERVICE CENTER.

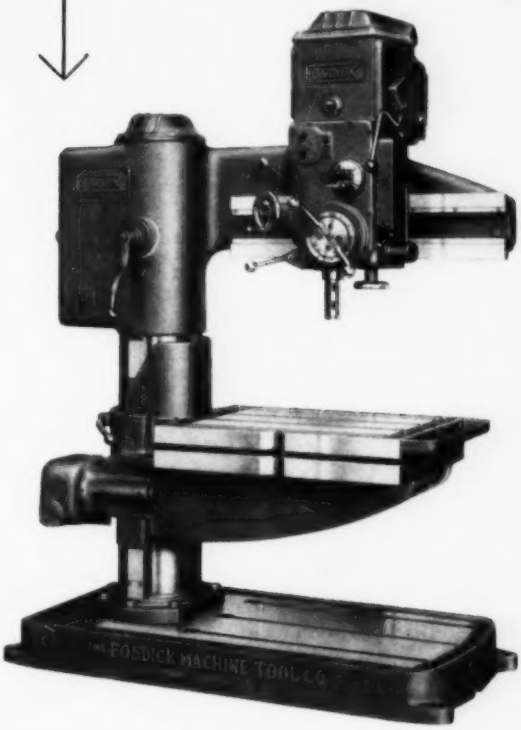
the *Carpenter* Steel Company, Reading, Pa.



# WHY BUY TWO ..... WHEN one WILL DO?

Fosdick's Sensitive Radial combines Upright and Sensitive features—rigidity, compactness and convenient table height—with the capacity and flexibility of a Radial. Fosdick has made the table unusually adjustable, leaving the arm at a fixed height. The unique, one-piece column construction makes possible unusual rigidity. Arm clamping is simplified. You get *all* the advantages of *both* the old reliable drills, at roughly the cost of one!

Workpiece sizes accommodated by the Sensitive Radial include the ranges of both Uprights and Radials; setting up on either the adjustable table or the base of the machine. Controls remain clustered at a constant, convenient operator's height.




**YOUR TOOL DOLLAR** buys more capacity in less shop space when you put Fosdick's compact versatility to work on your drilling problems. Only Fosdick builds the Sensitive Radial. Call your distributor or write for Bulletin SRA.

**THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO**

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
JIG BORERS & GRINDERS
NUMERICAL CONTROLLED PRECISION BORING MACHINES
SENSITIVE RADIAL DRILLS

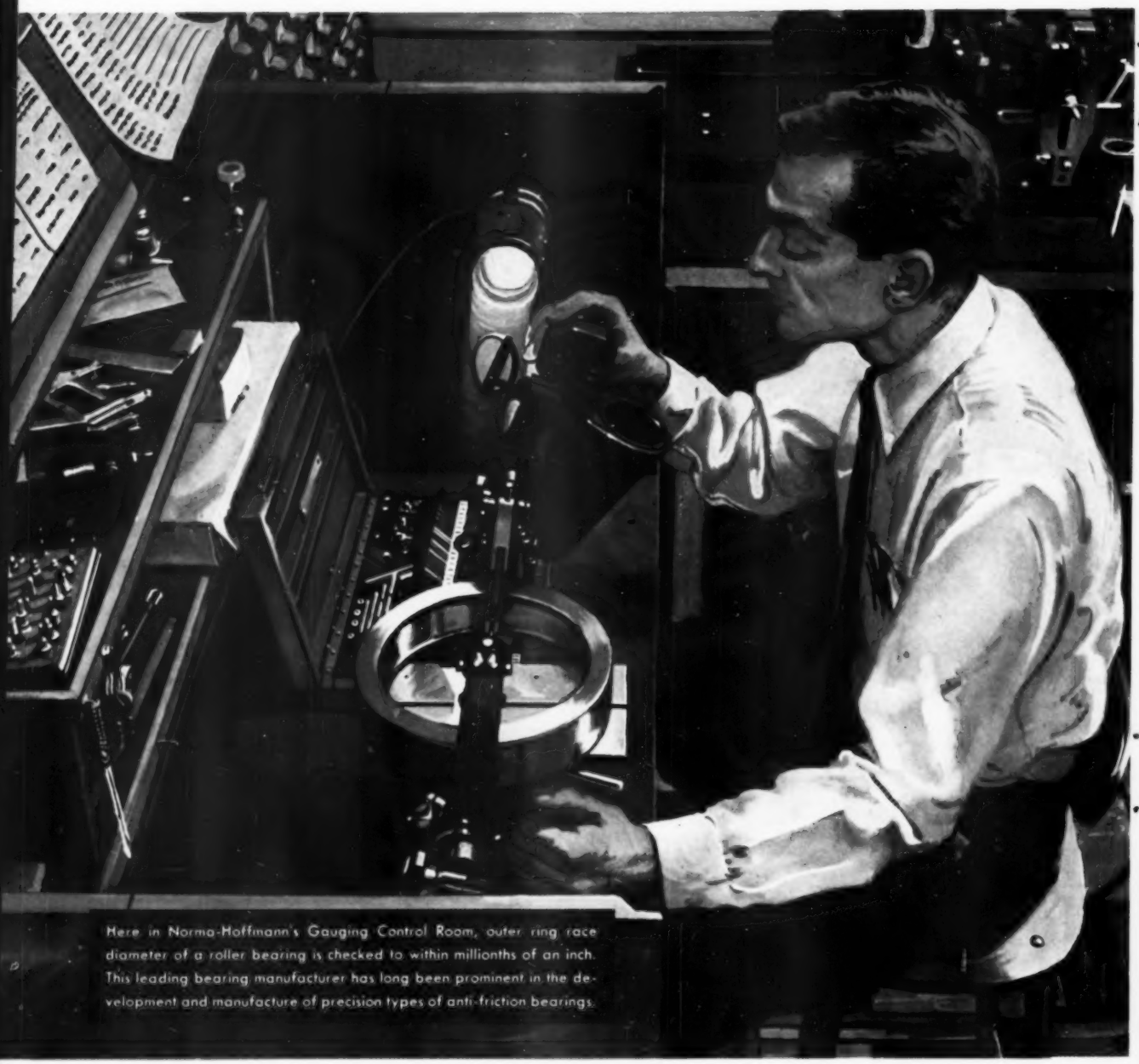
FOSDICK

◄ CIRCLE 224 READER SERVICE CARD

CIRCLE 225 READER SERVICE CARD

*Correct Lubrication in Action...*

# Bearing manufacturer



Here in Norma-Hoffmann's Gauging Control Room, outer ring race diameter of a roller bearing is checked to within millionths of an inch. This leading bearing manufacturer has long been prominent in the development and manufacture of precision types of anti-friction bearings.

Mobil

**Complete Engineering Program**
**Proved Petroleum Products**

**Mobil**

# rolls up $23,530 saving!

"In a growth company, we cannot afford to delay tomorrow's decisions while we stamp out today's brush fires. What plagues those of us in management are the myriad, small unknown-to-us problems that soar production costs, affect competitive position. This is where Mobil is helping us reduce manufacturing expense and improve production. Our 1958 records show that we saved over three times as much as we spent with Mobil last year . . . a most profitable relationship!"

R. D. Robertson

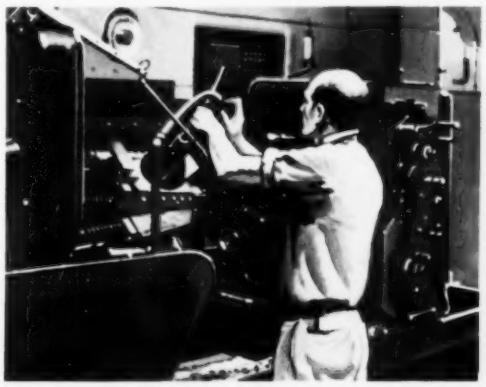
Vice-President—Manufacturing
Norma-Hoffmann Bearings Corporation, Stamford, Conn.

Mr. Robertson's words underscore the importance of Correct Lubrication to any profit-minded manufacturer. At Norma-Hoffmann Bearings Corporation Mobil lubrication engineers work closely with an extremely cost-conscious maintenance department. Downtime, parts replacements and maintenance costs have been cut—$23,530 saved in 1958 alone. Some of these savings are detailed below.

*For example:* Sticking valves on one grinder were a constant problem. Cause of the trouble was a mystery. Mobil's representative sent a sample of lubricant from the machine's reservoir to the Mobil laboratory. Analysis report led to cause of trouble—a lead sheathed cable submerged in the oil reservoir was contaminating oil. This detective work on the part of Mobil restored continuous production, saved $5,850 in maintenance costs.

This kind of practical engineering help is just a part of a Mobil program of Correct Lubrication. For complete details on how Mobil can improve your profits call your nearest Mobil representative. You'll find—You're Miles Ahead with Mobil!

Erratic, stick-slip operation of three grinders caused poor size holding. Mobil engineers found trouble was caused by deposits on valves and use of incorrect competitive oil. A correct way and hydraulic oil was installed. Greater production, fewer wheel dressings, less scrap and reduction in valve-cleaning costs saved $8,640.



To keep 16 of Norma's Multiple Spindle Bar machines functioning properly required a weekly 40-minute production interruption on each one to supply lubricant for tool slides. Mobil engineer studied procedure . . . suggested a simple lubrication system modification. Application time was reduced 75% . . . $7,040 saved on production and application.

# Correct Lubrication

***Another reason You're Miles Ahead with Mobil!***

# Introducing the NEW MODEL 1-A SEVER-ALL Machine... CUTS AT 3 to 6 SECONDS PER SQUARE INCH—ECONOMICALLY

### MANY EXTRA FEATURES AT A DELIVERED COST UNDER $500

You get the cut quality and capacity of machines nearly three times as expensive when you use the new Model 1-A SEVER-ALL oscillating dry abrasive cut-off machine. Available from your distributor's stock. Here's why the #1-A SEVER-ALL is ideal for industrial and machine shop operations:

***BIG CAPACITY*** • Up to 2" square solids, 3½" O. D. pipe and tubing, 3" angle iron, and 4" channels . . . of cold rolled, stainless, and alloyed steel; cast iron; and nonferrous metals. Wheel oscillation, an exclusive feature in this price range, provides this *above-average* capacity.

***SPEED*** • Cuts a 2" x 2" hardened steel bar in 16 seconds . . . other shapes and sizes at 3 to 6 seconds per square inch.

***QUALITY*** • Clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting.

***ECONOMY*** • In addition to low initial cost, the Model 1-A SEVER-ALL is inexpensive to operate . . . occupies minimum floor space . . . requires little or no set-up time . . . eliminates annealing costs . . . gives more cuts per wheel because of oscillation.

***SIMPLICITY*** • Just two SEVER-ALL cutting wheel specifications will do *all* your SEVER-ALL cutting jobs. A positive, screw-type vise holds all regular shapes, and an adjustable work stop provides speed and accuracy.

***ANGLE CUTS*** • Optional accessory permits cutting angles up to 45° in either direction.

### NEW SEVER-ALL AVAILABLE FROM DISTRIBUTORS

Very likely your own distributor already stocks the Model 1-A SEVER-ALL machine and wheels. If not, let us know, and we'll give you the name of your nearest SEVER-ALL distributor. Also, we'll be glad to send you complete details on this new machine. Just ask for **Bulletin DH-106.**

## ALLISON-CAMPBELL DIVISION AMERICAN CHAIN & CABLE

ACCO

923 Connecticut Avenue, Bridgeport 2, Conn.

# Cost-Cutting-

## A SIMPLE MATTER OF SELECTION

59-15

COUNTERBORE SETS

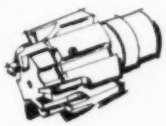
INVERTED SPOT FACERS

COUNTERBORES—

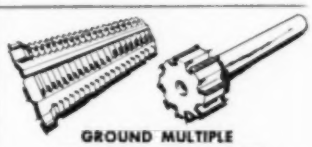
COUNTER SINKS, HOLDERS, PILOTS

FLOATING TAP DRIVERS

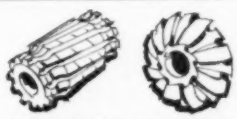
INSERTED BLADE FACE MILLS



MULTIPLE DIAMETER BORING CUTTERS



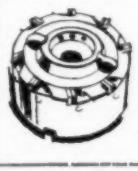
GROUND MULTIPLE THREAD MILLING CUTTERS



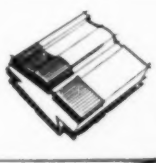
GROUND AND UNGROUND FORM-RELIEVED CUTTERS

SINGLE-POINT CARBIDE TIPPED TOOLS

MULTIPLE STEP BORE REAMERS



CARBIDE TIPPED CYLINDER BORING CUTTERS



DOVETAIL FORM TOOLS

CARBIDE TIPPED BROACH SECTIONS

INVOLUTE SPLINE SHELL TYPE BROACHES

◄ CIRCLE 228 READER SERVICE CARD

Every standard and special tool is of but one quality—the finest available. Since 1921, Continental has specialized in cost-saving cutting tools (just a few of which are shown at left), producing design innovations in hardened, high-speed tool steel, carbide and special-alloy cutting materials.

Available in the types and sizes required to do the *complete* job from rough to finish, Continental Cutting Tools are job-tested in the toughest proving ground—Ex-Cell-O's own machine tool and precision parts production lines. As a result, they come to you ready to increase the output of even your best machines!

Continental engineers will be glad to work with you in selecting the correct CTW Cutting Tool for long life and maximum performance. See your local Ex-Cell-O Representative, or write direct to Continental Tool Works Division for full details. In Canada, contact your local Ex-Cell-O Sales Associates Representative or write direct to Colonial Tool Co., Ltd., Windsor.

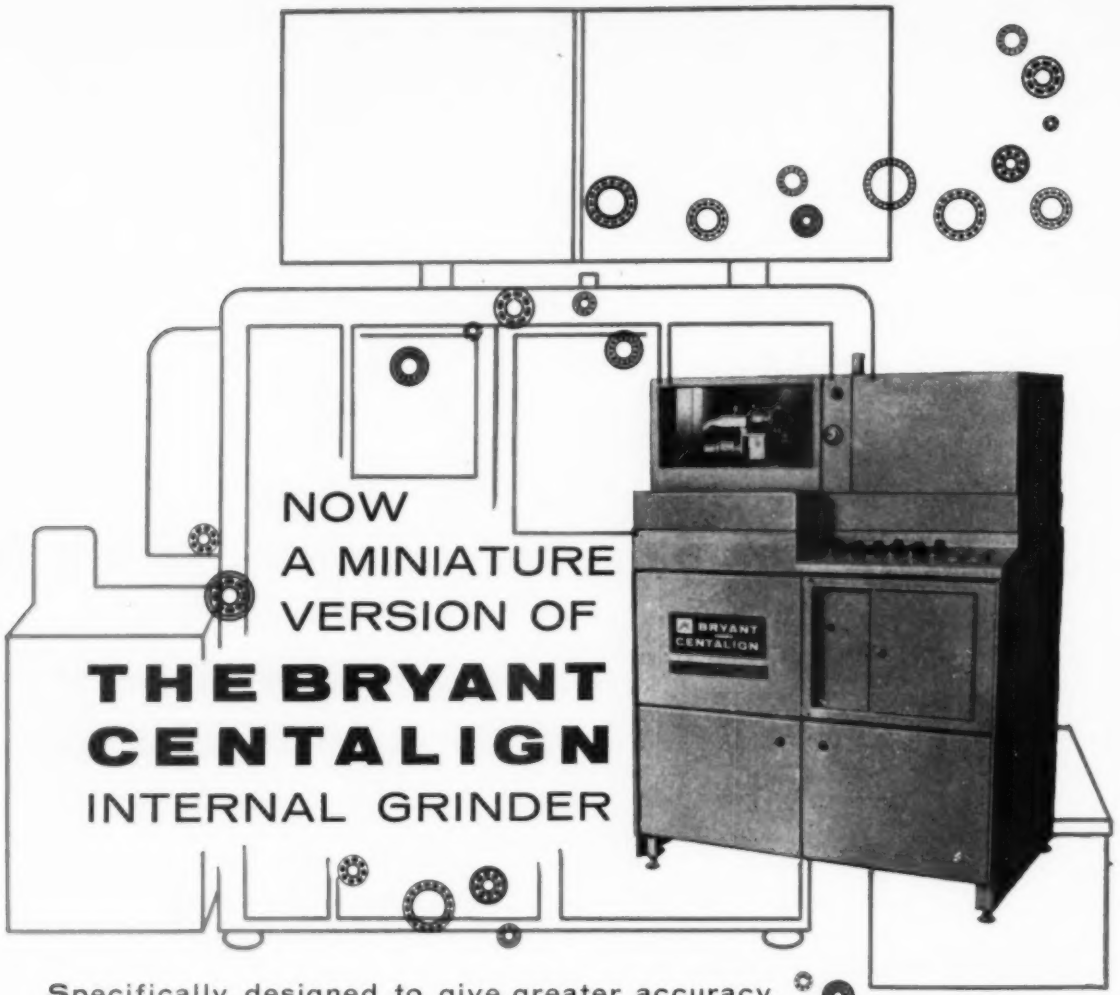
**Continental TOOL WORKS**

**DIVISION OF**

**EX-CELL-O CORPORATION**

DETROIT 32, MICHIGAN

CIRCLE 229 READER SERVICE CARD




NOW
A MINIATURE
VERSION OF

# THE BRYANT CENTALIGN INTERNAL GRINDER

**Specifically designed to give greater accuracy, speed and flexibility in the production of miniature bearings**

The Bryant Miniature Centalign Model B brings new efficiency and accuracy to the grinding of bores and internal ball tracks in miniature and instrument bearing races. This new grinder is extremely compact, requiring only 8¼ square feet of floor space — half the space required by machines currently in use.

The exclusive Bryant feature of interchangeable "packaged tooling" allows set-up away from the machine, and results in almost uninterrupted machine production. Long periods of downtime usually required to retool for work part changes are eliminated.

Other time — and — money saving features include:
**Automatic New Wheel Dressing* — New wheels automatically dressed to correct size for maximum wheel life.
**Selective Skip Dressing* — Flexibility in cycling to suit job requirements.

Here is the answer to demands for faster, more accurate bearing production! Write now for complete details.

## BRYANT Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Chicago • Syracuse • Cleveland • Indianapolis • Detroit • Springfield, N. J. • Los Angeles

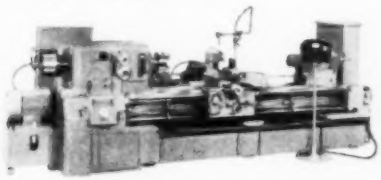
# It's a breeze

## TO CUT COSTS, BOOST PRODUCTION AND QUALITY WITH THE MONARCH "AIR-GAGE TRACER"

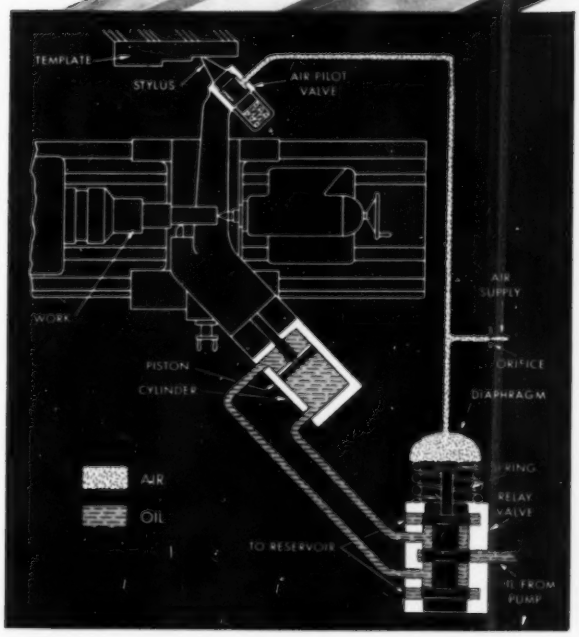
No lathe development in recent years has equaled template controlled turning for substantial cost reduction. Its advantages, when performed the Monarch "Air-Gage Tracer" way, are many. This duplicating method:

- Always outproduces a manually operated machine; in some instances as much as 8 to 10 times.
- Provides automatic sizing, thereby reducing spoiled work to the absolute minimum.
- Imparts a smooth, stepless finish on any combination of cuts, whether turning, facing or boring.
- Often halves amount of stock left for grinding; sometimes eliminates grinding and polishing operations.
- On most work, reproduces accuracy of template within ± .001".
- Eliminates the need for expensive form tools and the cost of multiple tool setups.
- Allows a complete setup change in as little as 15 to 20 minutes; tool change in 1 minute.

Write for complete descriptive booklet No. 2608. It contains dozens of typical job examples... ***The Monarch Machine Tool Company, Sidney, Ohio.***



Above is a Monarch Series 62 Preselector Dyna-Shift Lathe with "Air-Gage Tracer" and auto cycle unit. This duplicating means may be factory applied to all Monarch lathes.




This diagrammatic drawing shows simplicity of "Air-Gage Tracer" operation. Note that design deals with both air and oil in constant motion. Result—super-accuracy piece after piece, job after job.

### *Exclusive Features of the "Air-Gage Tracer"*

1. The only lathe duplicator which utilizes the combination of air-hydraulic control. That's the secret of its super-accuracy.
2. The air circuit is an open loop servo system which provides air-gaging and multiplies both force and motion.
3. It's the simplest and most trouble-free of all lathe duplicating methods. Tracer head maintenance is never a costly problem.
4. Stylus pressure against template is only 5 to 6 ounces, practically eliminating template wear.
5. Either a flat or a round template may be used. Never is it necessary to use a large, bulky round template so that it can be indexed periodically due to excessive wear from high stylus pressure.
6. Available both in a rigid and swiveling type, the latter of which may be used at any setting between 45° and 90°. Universal nature of swiveling type a "must" for top production on many complex facing and boring operations.
7. The only lathe duplicator offered optionally with full automatic cycling and potentiometer feed control.

**Monarch**
**TURNING MACHINES**
FOR A GOOD TURN FASTER — TURN TO MONARCH

# Allen Hughes cut abrasive costs 18 to 1 at

Grinding the gripper-die marks off a jet turbine blade can be an expensive business. At the Harrisburg Works of Thompson Ramo Wooldridge, these super-alloy steel blades used to be semi-finished with coated abrasive belts until Industrial and Abrasive Control Engineer Paul Mazich started checking up on costs.

Mazich called in Bay State Abrasive Engineer Allen B. Hughes and he dug into the problem. Working with Bay State distributor General Machinery & Equipment Company, Hughes made a series of careful tests. The result was a grinding wheel that cut the annual cost of abrasive materials alone from $18,000 to $1,000. Its unique combination of special bond and abrasive grit increased cutting spread, prevented loading and eliminated the need for dressing so successfully that productivity rose, labor costs dropped and there were additional savings of around $5,000.

Like Allen Hughes, the Bay State Abrasive Engineer in your area is a trained expert. He backs up the work of the experienced men who represent Bay State's topflight distributors and Bay State's research labs back them both with new ideas, techniques and materials. *Better grinding at lower cost . . . that is our business.*

Industrial Engineer Paul Mazich examines finish on jet engine blade forging after off-hand grinding operation illustrated at right.

Operator E. S. Jones semi-finishes jet turbine blade in off-hand grinding operation with cool-cutting, self-dressing Bay State grinding wheel.

# Thompson Ramo Wooldridge

Allen B. Hughes worked up through Bay State's Westboro plant and then added extensive field experience so that his knowledge of abrasive problems and practical solutions for them covers every phase of abrasive engineering.

# BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
*In Canada:* Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
*Branch Offices:* Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles. *Distributors:* All principal cities.

Complete DRILLING

# versatility

for the "cumbersome" parts... with U. S. DRILL HEADS

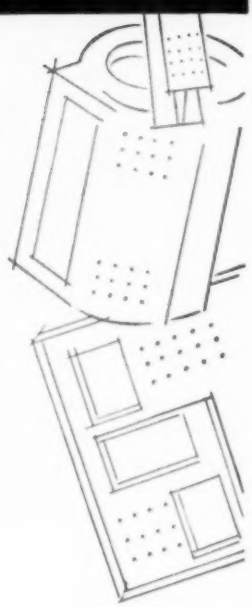
- ☐ Full ball bearing mounting of shafts
- ☐ Shaved gears throughout
- ☐ Exclusive quick-change neoprene-sealed universal joints
- ☐ Heavy duty spindle assemblies
- ☐ Adjustable-arm spindle mounts, or special bored Slip Spindle Plates
- ☐ Oil-tight, high-strength cast housings

Is your drilling *accurate and economical* in structural steel, tube sheets, flue sheets, and other large, cumbersome parts? It will pay you to check into a U. S. Drill Head installation on your radial drill!

Style U Universal Joint Adjustable Heads equipped with Air Counterbalance and 360° Ball Bearing Swivel Attachment give added versatility to any radial drill. Quick setup with positive lock of swivel in aligned position. Fast and accurate operation with minimum operator fatigue.

Select the *right* head for your jobs from the many sizes of Style U Heads. You'll get lots of cost-reducing features.

*Write for descriptive literature, or ask for recommendations on your particular multiple drilling problems.*



US DRILL HEAD

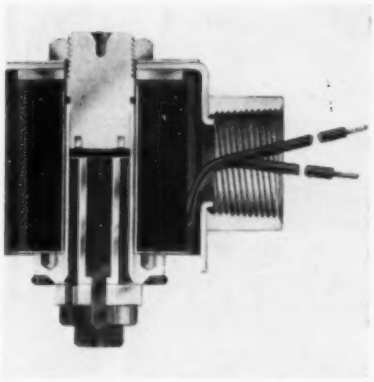
Adjustable and Fixed Center Multiple Drilling Heads.
Individual Lead Screw Multiple Tapping Heads.

**UNITED STATES DRILL HEAD CO.**

BURNS STREET • CINCINNATI 4, OHIO

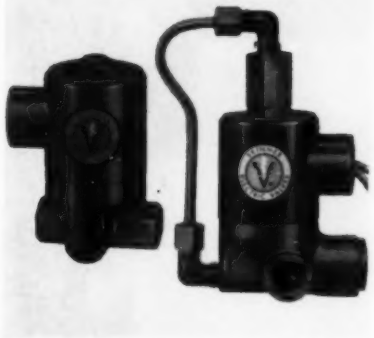
# Skinner introduces Two-Way Solenoid Valve for Control of High Pressures

**New High Pressure Models** just added to the Skinner two-way Type R series line of pilot-operated solenoid valves are offered in two-way normally closed construction only. Orifice size is ¼" diameter with ¼" NPT ports. Operating pressure differentials: 5 to 1250 psi on AC voltages and 5 to 1000 psi on DC voltages. Designed for use with such media as air, oil, water and semi-corrosive liquids.

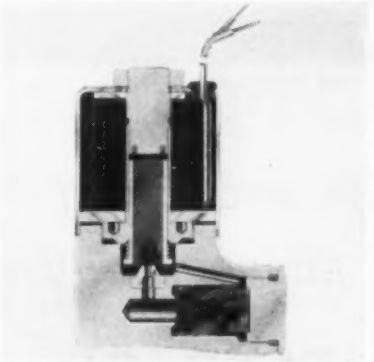


**Features.** New Skinner Models are built to U. L. requirements in standard and explosion-proof construction. V5-2H type solenoid operator contains stainless steel internal parts to resist corrosion. Valve body is forged naval brass and contains stainless-steel piston assembly, precision machined to close tolerances for positive opening and closing of the main orifice.

**Variety of Coil Voltages.** Standard coils, built to U. L. standards, are varnish-impregnated and moisture-resistant. Molded waterproof coils are available that will even operate under water and are resistant to fungus growth. Coils are available in wide range of voltages and frequencies.



**Standard Pressure Two-way R Series Valves.** These two-way valves are available in standard and explosion-proof construction, normally open or normally closed. Pressure operating differentials are 5 to 200 psi for normally closed and 5 to 150 psi for normally open.



**Many Desirable Features:** Standard pressure R series two-way valves have V5 type operator; stainless steel internal parts; naval brass body; stainless-steel piston assembly; soft synthetic inserts for bubbletight operation. Normally open models have piped-body return. Valve can be mounted in any position.

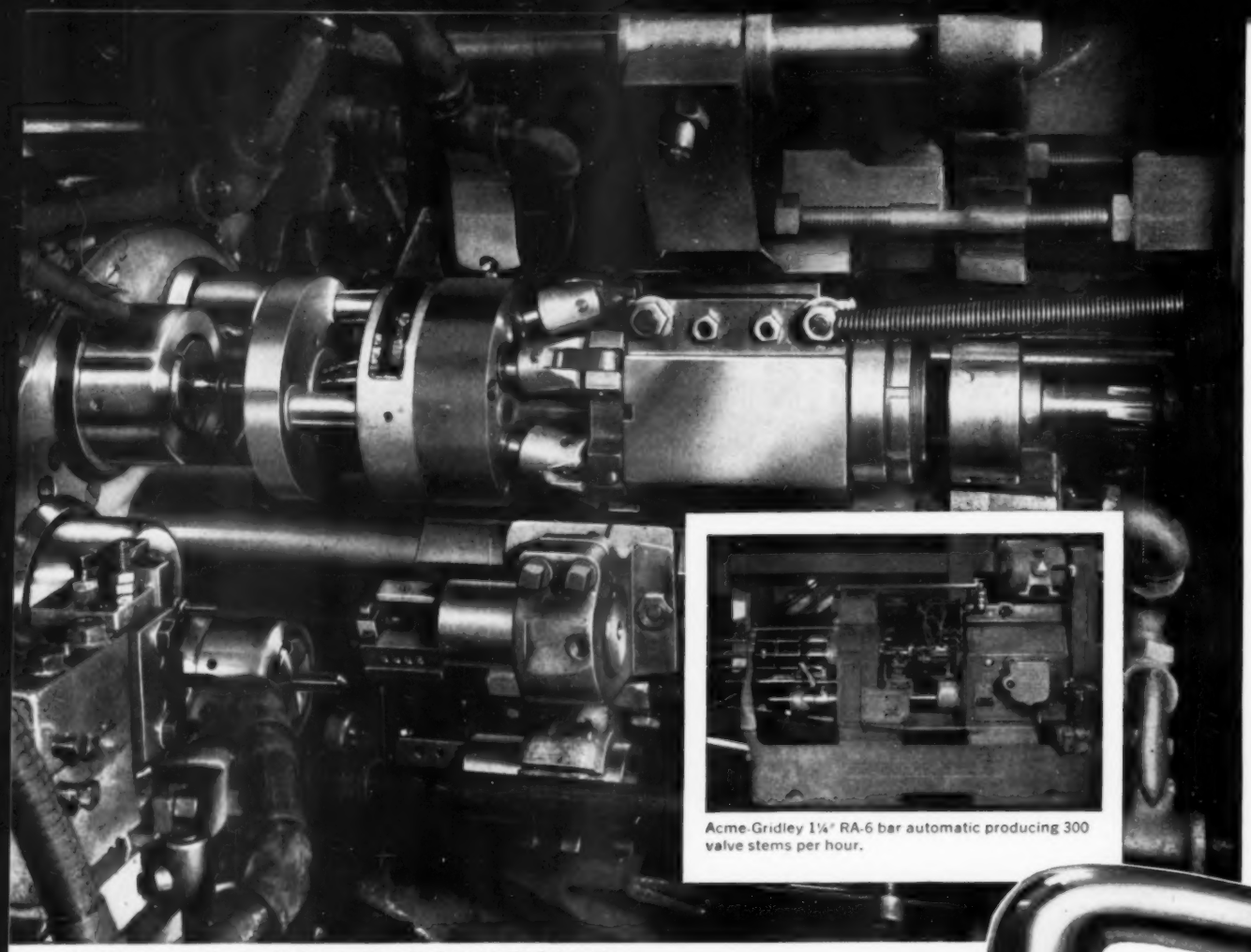
**Custom Installation** with these Options. There is a large selection of electrical housings that can be rotated 360° for easy connecting. Also available is manual override that permits opening or closing the valve in the event of current failure.

*Skinner Solenoid Valves are distributed nationally.*

For complete information, contact a Skinner Representative listed in the Yellow Pages or write us at Dept. 305.

SKINNER ELECTRIC VALVES

THE CREST OF QUALITY **THE SKINNER ELECTRIC VALVE DIVISION • NEW BRITAIN, CONNECTICUT**



Special Namco-designed multiple end milling attachment in the 3rd position.

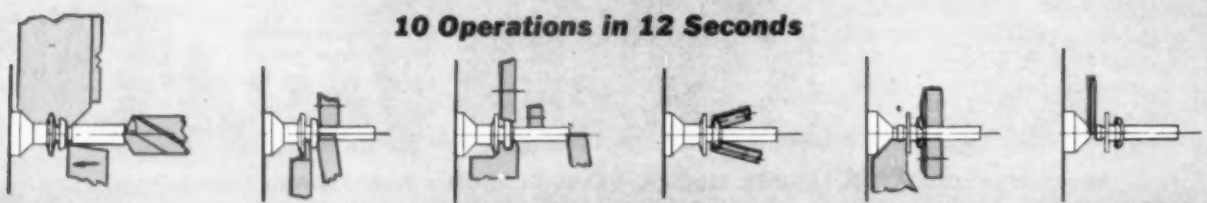


Acme-Gridley 1¼" RA-6 bar automatic producing 300 valve stems per hour.

*When Tolerances and Finish Looked Economically Impossible*

# AMERICAN-STANDARD TURNS TO ACME-GRIDLEY...

***10 Operations in 12 Seconds***



**6th position**
Rough form rear —rough turn stem —spot drill

**1st position**
Finish turn stem face large diameter

**2nd position**
Shave—face and chamfer stem end

**3rd position**
Stop spindle— mill six slots

**4th position**
Start spindle— burnish stem— form back end

**5th position**
Cutoff

**COMPLETED IN A SINGLE SETUP . . .** this hyseal valve stem is a vital component in American-Standard's single-lever mixing faucet. Production by other processes would have meant a two-piece assembly. It would have been economically impossible to meet the high standard of quality and exacting tolerances maintained on this company's products.

Ten operations, including multiple end milling of six half-holes on a 15° angle, were performed on this 303 stainless steel piece in 12 seconds. Rigid specifications required a 20 microinch finish and limits of .002 t.i.r. between seating surface and end of valve stem.

Advanced spindle stopping design and the inherently accurate indexing of Acme-Gridleys, assure proper alignment of the work with the standard and special tool attachments. This, together with wide open tooling zones and independently operated tool slides, helps assure the solution of "impossible" jobs at National Acme. Write or ask one of our representatives for the complete story on the industry's most modern approach to your cost reduction problems.

Pioneer in Circumferential Automation

**National Acme**

The National Acme Company
171 E. 131st Street
Cleveland 8, Ohio

Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

# PRODUCING

LE MAIRE

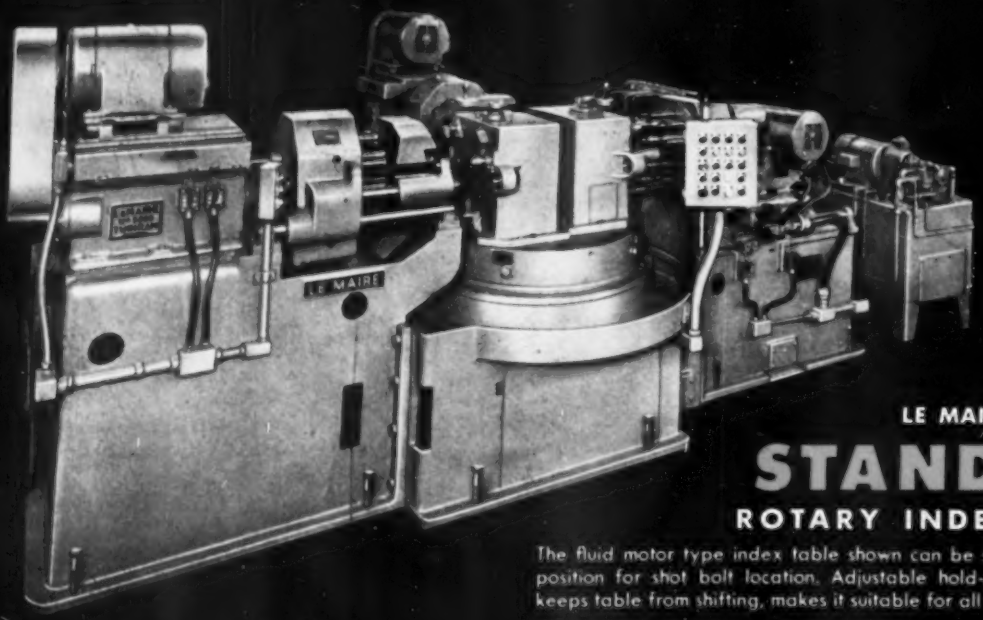
## STANDARD
### MILLING HEAD UNITS

Vertical milling head cleans up mounting face of oil pump covers. Other operations on this machine include drilling and reaming. Production is 90 parts per hour at 100% efficiency.

LE MAIRE

## STANDARD
### DRILLING UNITS

Multiple tooling on standard units performs drilling, reaming, counterboring and tapping of 75 flywheels hourly. While units shown are quill type, LeMaire also manufactures standard way type units.




LE MAIRE

## STANDARD
### ROTARY INDEX TABLES

The fluid motor type index table shown can be set to stop in exact position for shot bolt location. Adjustable hold-down arrangement keeps table from shifting, makes it suitable for all types of machining.

# with LE MAIRE

## STANDARD BUILDING BLOCKS

*Give You Economy . . . Flexibility . . . Simplicity*

Before you automate . . . *investigate* the complete LeMaire line of standard hydraulic power units. Each is practical, efficient, economical . . . and nearly as flexible in application as a standard electric motor!

These LeMaire "building blocks" are designed for interchangeable installation on a wide variety of standard bases. This allows low-cost unitized construction, in minimum lead time, of a "special" which solves *today's* production machining problem . . . and which can be economically converted or modified to meet *future* needs.

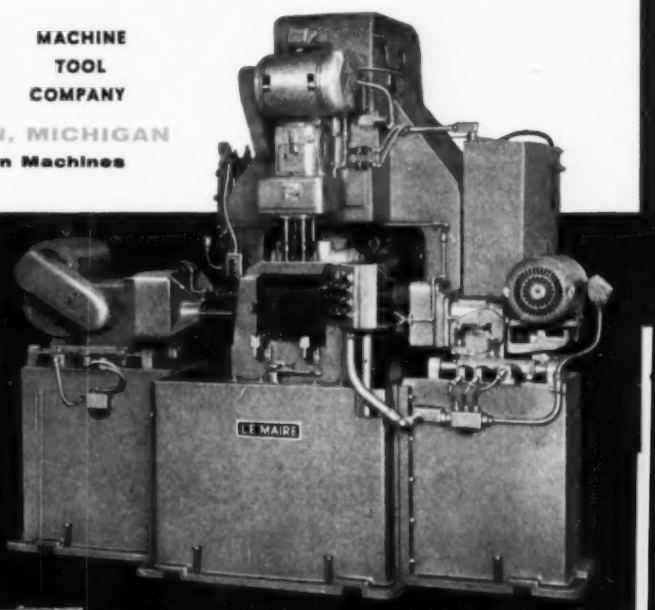
LeMaire standard units are suitable for drilling, boring, counterboring, reaming, spot-facing, tapping and milling. They operate in horizontal, vertical or angular positions. Infinite control of feeds is provided, along with construction which assures twist-free, straight line, uniform operation under all production conditions. All units are built to J.I.C. standards.

For practical, economical, flexible automation, check the possibility of using LeMaire "do-it-yourself" building blocks . . . or ask LeMaire engineers to recommend the right combination for your specific production machining problem. Send parts or prints for prompt recommendations.

**LE MAIRE** MACHINE TOOL COMPANY

2657 S. TELEGRAPH ROAD • DEARBORN, MICHIGAN

**Designers and Builders of Special High-Production Machines**

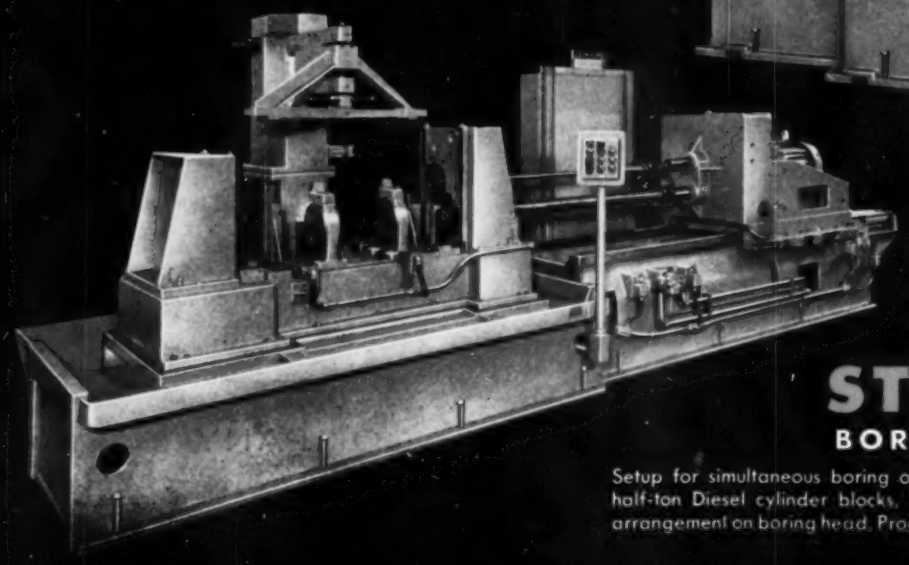



LE MAIRE

**STANDARD**

**LEAD SCREW TAPPING UNITS**

Four sides of farm tractor hydraulic reservoir are tapped at once by this machine, arranged with various size master lead screw tapping units. Production is 56 parts per hour at 100% efficiency.



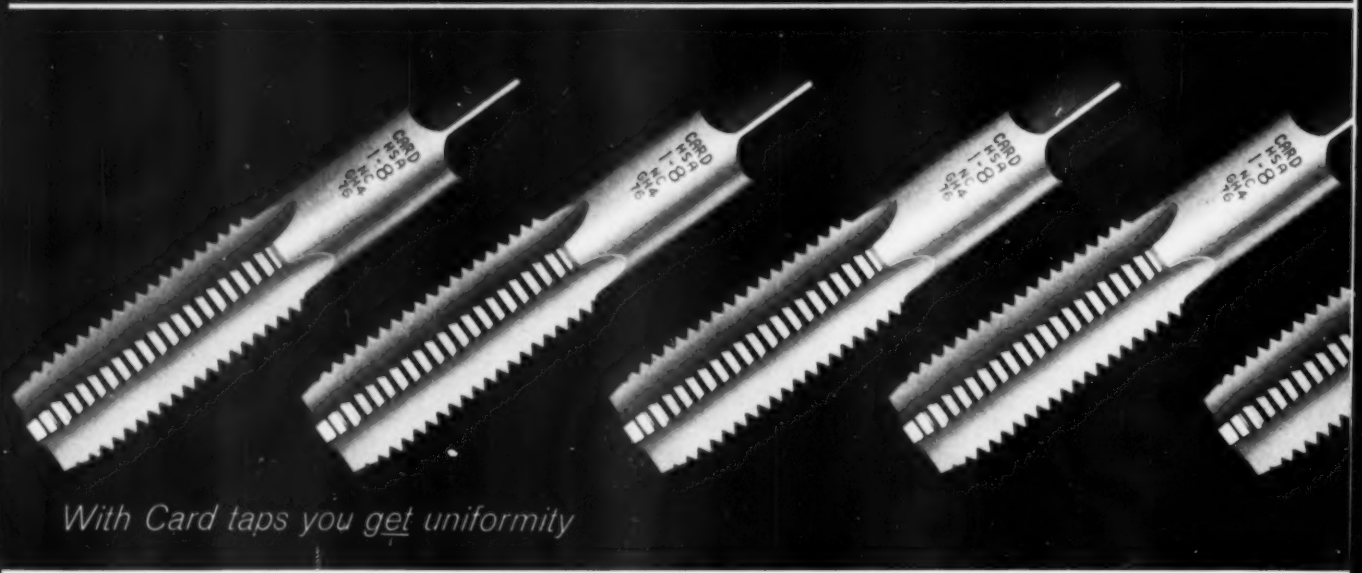
LE MAIRE

**STANDARD**

**BORING HEAD UNITS**

Setup for simultaneous boring of camshaft and crankshaft bores in half-ton Diesel cylinder blocks. Way type unit has tool positioning arrangement on boring head. Production is 9.4 cylinder blocks per hour.

*When you see uniformity, remember . . .*



*With Card taps you get uniformity*

# *Your production's consistent ...because Card taps are uniform*

Keeping production up to par calls for cutting tools that perform correctly whenever used — and are exactly alike, whenever reordered. You're sure of these advantages with Card taps, because each is identical with every other of the same type and size. Shopmen everywhere know this—have been shown by Card technical men how the uniformity of Card taps and gages is predictable and profitable. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

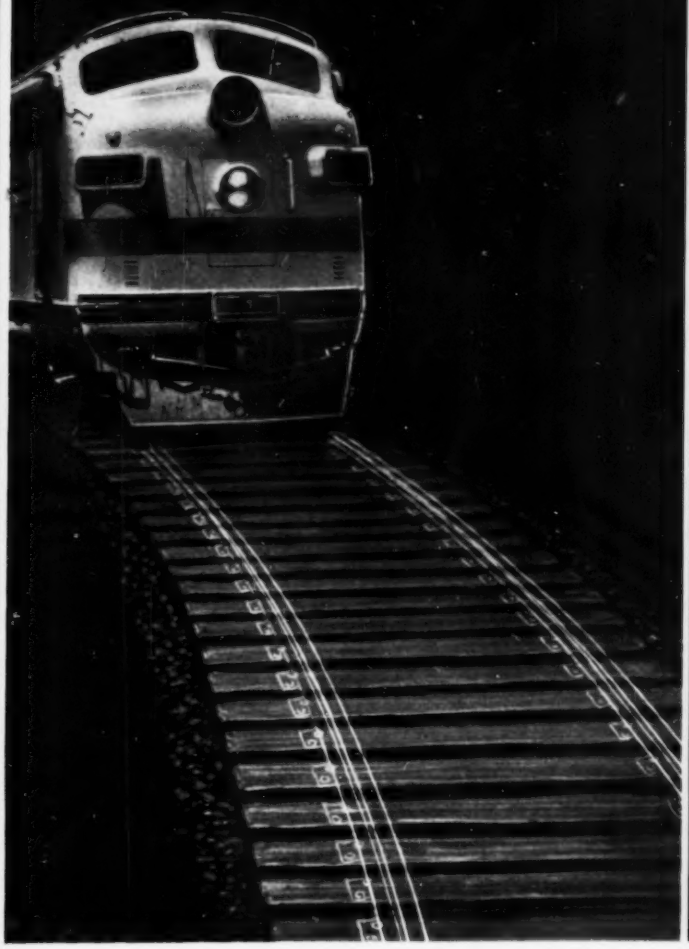
CARD

DIVISION OF UNION TWIST DRILL COMPANY

***— Serving you through the best distributors from Coast to Coast***

**CIRCLE 240 READER SERVICE CARD**

*If you use inserted blade cutters as much as railroads use ties . . .*



*Ordering Union cutters will cut your production time and costs*

# *The more you use cutters the more you need Union*

Typical of Union's continued pioneering in the development of cutting tools, Union inserted blade cutters are designed with keyways so placed as to enable several cutters to be interlocked for faster, more efficient operation. In plants throughout the country Union technical men are showing how production time and costs can be cut with highly advanced, top-performing Union inserted blade cutters, drills, end mills, milling cutters, gear cutters, reamers, hobs and carbide tools.

**Available nationally through Union Distributors** and stocked in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

UTD

# UNION

TWIST DRILL COMPANY, Athol, Massachusetts

S. W. CARD DIVISION, Mansfield, Mass., BUTTERFIELD DIVISION, Derby Line, Vt.

CIRCLE 241 READER SERVICE CARD

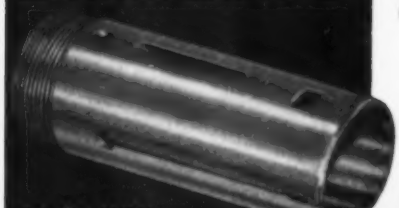
HARDINGE
ELMIRA, N.Y.

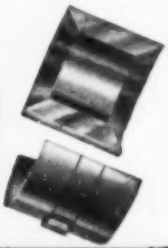
# STANDARD EQUIPMENT in Progressive Screw Machine Plants

The Only MASTER COLLET With No Work Pressure on the Screw.

*Style "S"*
*Master Collets and Pads*

Pads Interchangeable Among Different Makes of Automatics

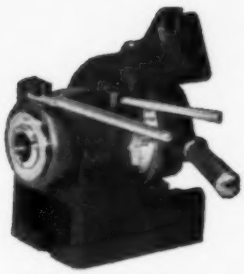




*Style "B"*
*Master Feed Fingers and Pads*

HARDINGE BROTHERS, INC., Elmira, N. Y.

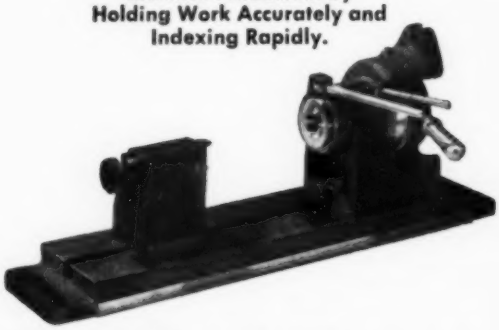
H-4 Tool Room-Inspection



HV-4 Production

# HARDINGE COLLET INDEX FIXTURES

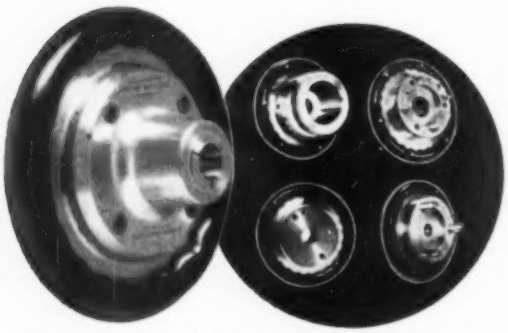
Increase Production by Holding Work Accurately and Indexing Rapidly.



HARDINGE BROTHERS, INC., Elmira, N. Y.

# HARDINGE-SJOGREN *Speed* COLLET CHUCKS

*Fast — Accurate*
*Increase Production Capacity*



Available in 1 1/16"; 1 5/8"; 2 1/4"; and 3 1/2" collet capacity. Threaded nose, cam lock, tapered key-drive and American Standard spindles. *Write for Bulletin 8A.*

HARDINGE BROTHERS, INC., Elmira, N. Y.

HARDINGE
ELMIRA, N.Y.

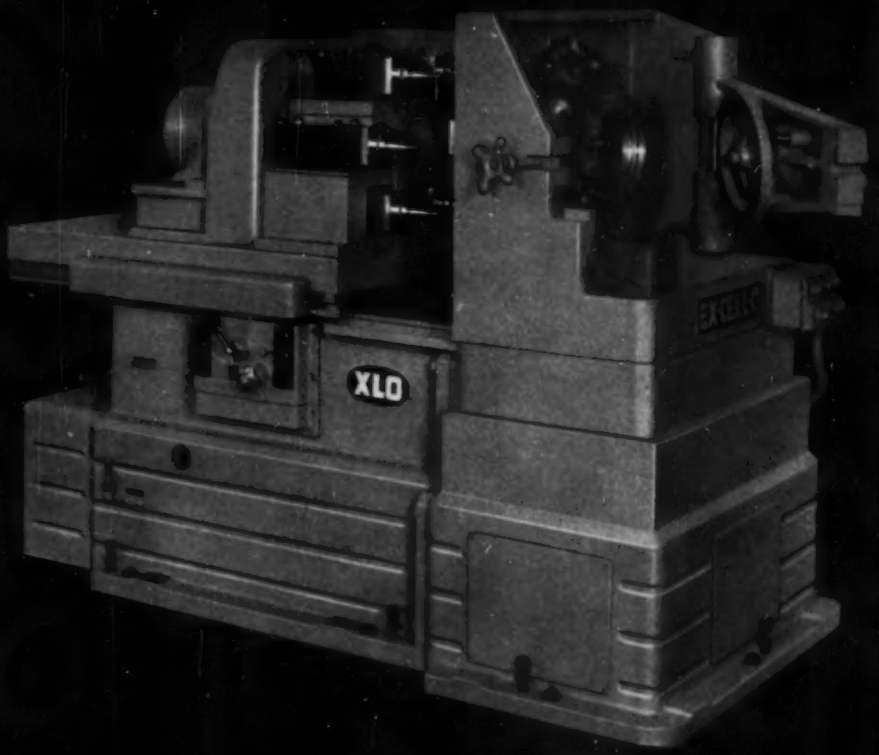
# COLLETS for LATHES and MILLERS

ACCURACY — DURABILITY — LOW COST

Write for Bulletin 56 — Complete collet ordering information for all Lathes, Millers, Grinders and Fixtures

HARDINGE BROTHERS, INC., Elmira, N. Y.

Immediate stock delivery from Elmira, Boston, Atlanta, New York, Hartford, Philadelphia, Rochester, N. Y., Dayton, Detroit, Minneapolis, Chicago, St. Louis, Oakland, Los Angeles, Toronto, Montreal.




# It's a 'special'— but it's ready to do other jobs, any time!

An Ex-Cell-O Way-Type unit can be a special-purpose production machine, or used with other units as an automated machining line. Various arrangements are outlined below.

59-21

## Ex-Cell-O Way-Type units use standard components for economy, flexibility...

**Ex-Cell-O Precision Way-Type Machines let you arrange and re-arrange combinations of standard machine components to create your own special machines for each new job. A self-contained Way unit consists of a base, a slide, and hydraulic power and controls to operate the slide; a universal end section supports the work fixture.**

**The typical single-unit Way Machine above bores and chamfers six holes at one feed stroke in a magnesium aircraft component. Hole locations are held to .001" tolerance, and finish bore diameters are accurate within plus or minus .0005".**

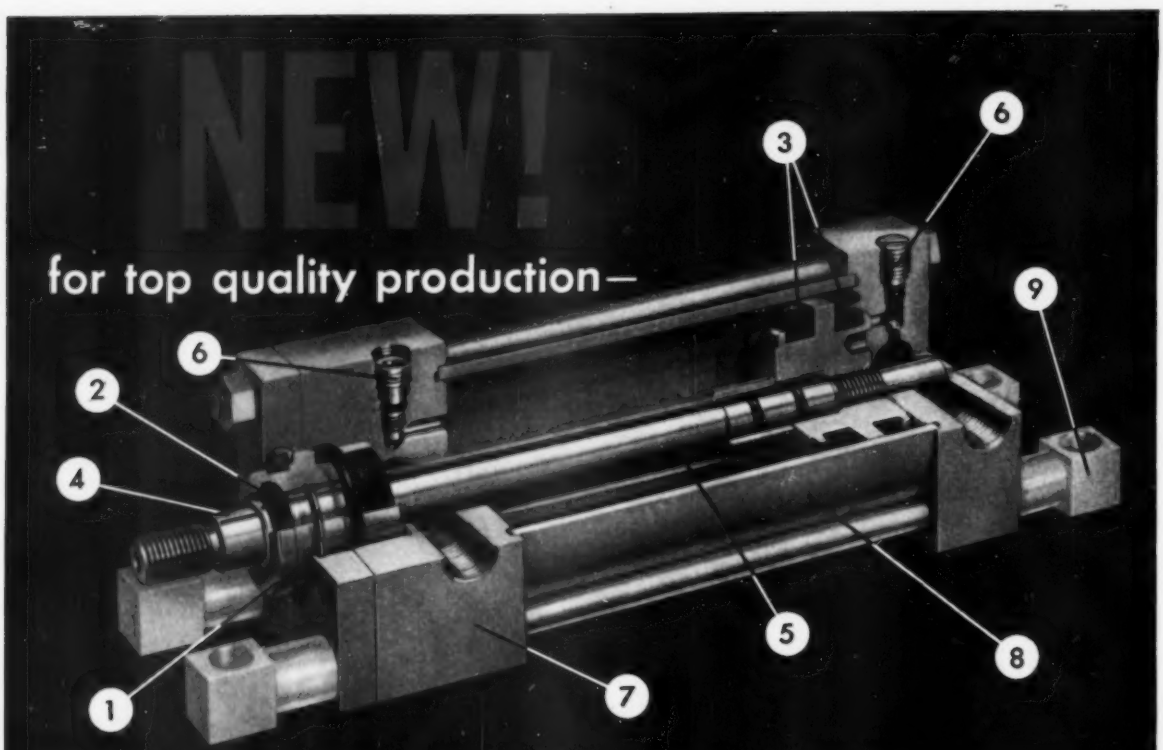
**Your local Ex-Cell-O Representative will welcome the opportunity to suggest other profitable Way Machine applications in your operation. Call him, or contact Ex-Cell-O, Detroit.**

EX-CELL-O FOR PRECISION XLO

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
*Machinery Division*

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS TORQUE ACTUATORS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

CIRCLE 243 READER SERVICE CARD




1. Bronze Bearing, with self-adjusting "U" Cup Piston Rod Seal for longer wear.
2. Rod Wiper protects Piston Rod Seal and keeps Cylinder clean.
3. "U" Cup Seals expand with pressure to provide positive seal with minimum friction.
4. Wrench Flats make for easy installation.
5. Ground, hard chrome plated Piston Rods have minimum yield strength of 125,000 psi.
6. Self-locking cushion adjusting screw and ball check are below surface for protection . . . easily accessible.
7. For extra strength, Cylinder-Ends and Mounting Plates are machined from bar stock and steel forgings.
8. Cylinder is precision-finished brass for extra heavy duty.
9. Variety of mountings can be interchanged—easily match any installation requirement.
10. Interchangeable with all JIC Cylinders.

# SCHRADER SQUARE-END CYLINDERS

## meet and exceed JIC specs . . . 250 psi air . . . 750 psi hydraulic!

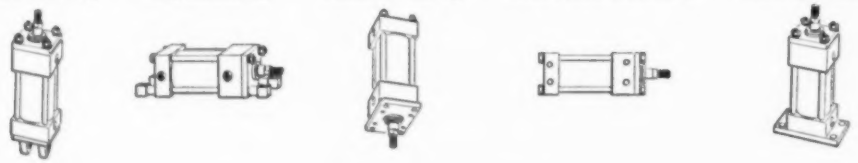
Here's compact, versatile straight-line power. Just look at the features!

Use Schrader's new square-end double-acting cylinders for holding, positioning, moving work—for push, pull or lifting—for automating manual operations. In five sizes up to 4-inch bore, and with five interchangeable mountings, these "square-ends" are economical and versatile. Bolt, leg, flush, side flush or base . . . each JIC Cylinder will mount all five ways. Suitable for air pressures to 250 psi, or hydraulically to 750 psi—available cushioned or non-cushioned.

You get safe, controlled, low-cost power with Schrader "square-ends"—another addition to the line of famous Schrader quality Air Control Products.

Complete stocks available locally—expert help to improve your air control hookups. Write for your complete specifications and data on these new "square-ends."

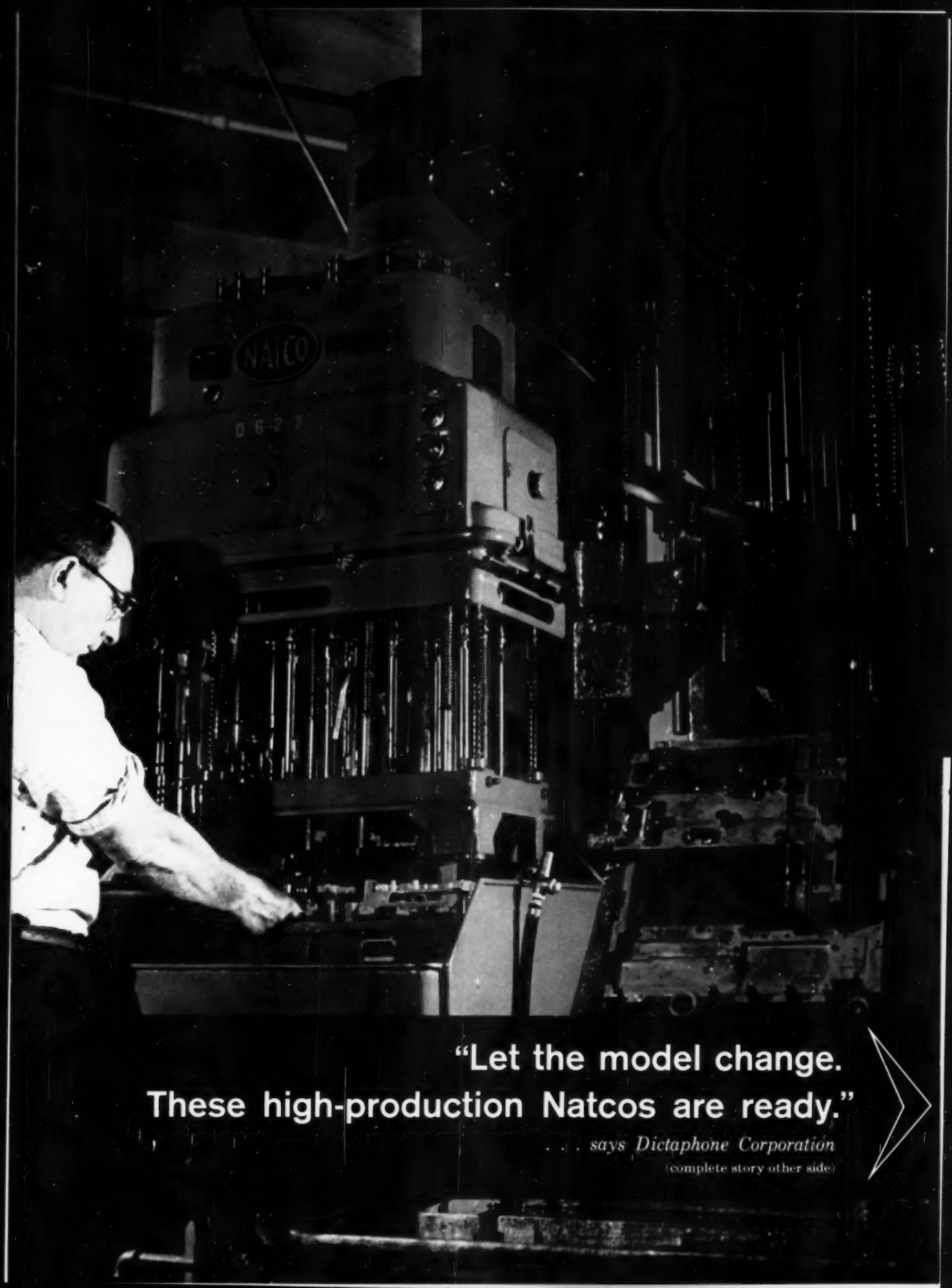
**Bolt Mounting** **Leg Mounting** **Flush Mounting** **Side-Flush Mounting** **Base Mounting**



Schrader® a division of SCOVILL

A. SCHRADER'S SON
*Division of Scovill Manufacturing Co.*
460 Vanderbilt Avenue, Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS



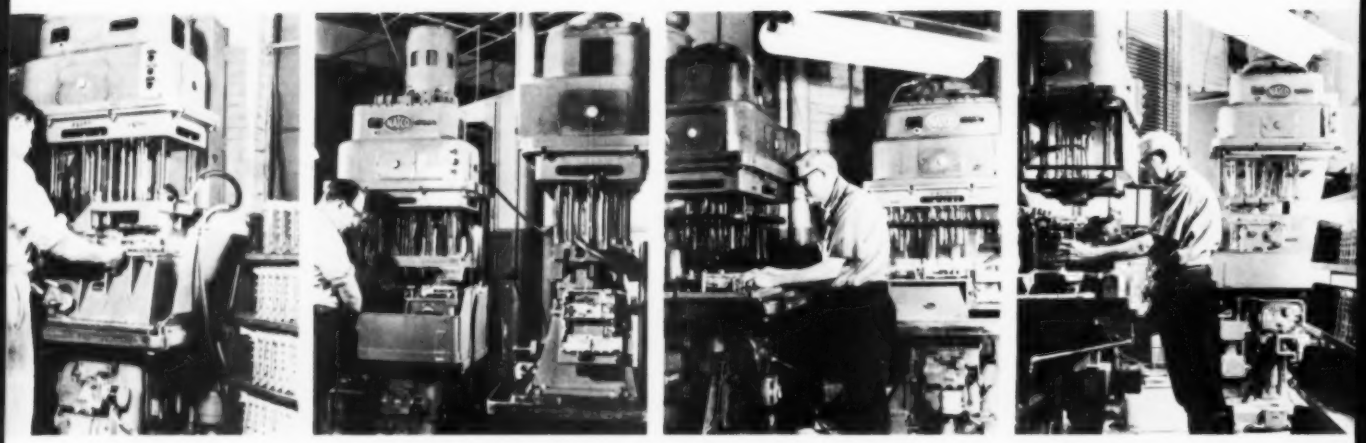

**"Let the model change.**
**These high-production Natcos are ready."**

*. . . says Dictaphone Corporation*

(complete story other side)

# Five parts for the cost of one!

# Fast changeover too!



## These 7 standard Natcos do it for Dictaphone!

Costs toppled 81%, savings exceeded $1.00 per part when Dictaphone Corporation, Bridgeport, Conn., switched from gang drill production to this line of seven high-production H-6 Natcos. *Standards*, not specials. They quickly convert when models change; and replacement parts for old models can be run on the same line with minimum time for changeover.

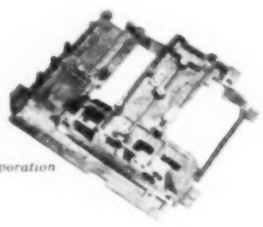
Dictaphone's part is a magnesium main frame for its Time-Master dictating machine. It calls for drilling 97 holes and performing 150 secondary operations—reaming, tapping, counterboring and countersinking on most of them. The seven multi-spindle Natcos handle all but 16 of these operations.

Besides increasing production 81 per cent, the seven Natcos eliminate skipped and creeping holes, and maintain close tolerances. Natco tooling locates the magnesium parts without warping stresses.

On the Natco H-6, the slip plate is the key to flexibility. For example, Dictaphone transferred four Natcos from other assignments, simply by fitting them with new slip spindle plates and, of course, new fixtures. Three new Natcos filled out the line.

Natco H-6 and other multi-spindle drilling machines are available in models from 1 hp with 10 spindles to 50 hp with up to 72 spindles. Write today for complete details or see your Natco representative.

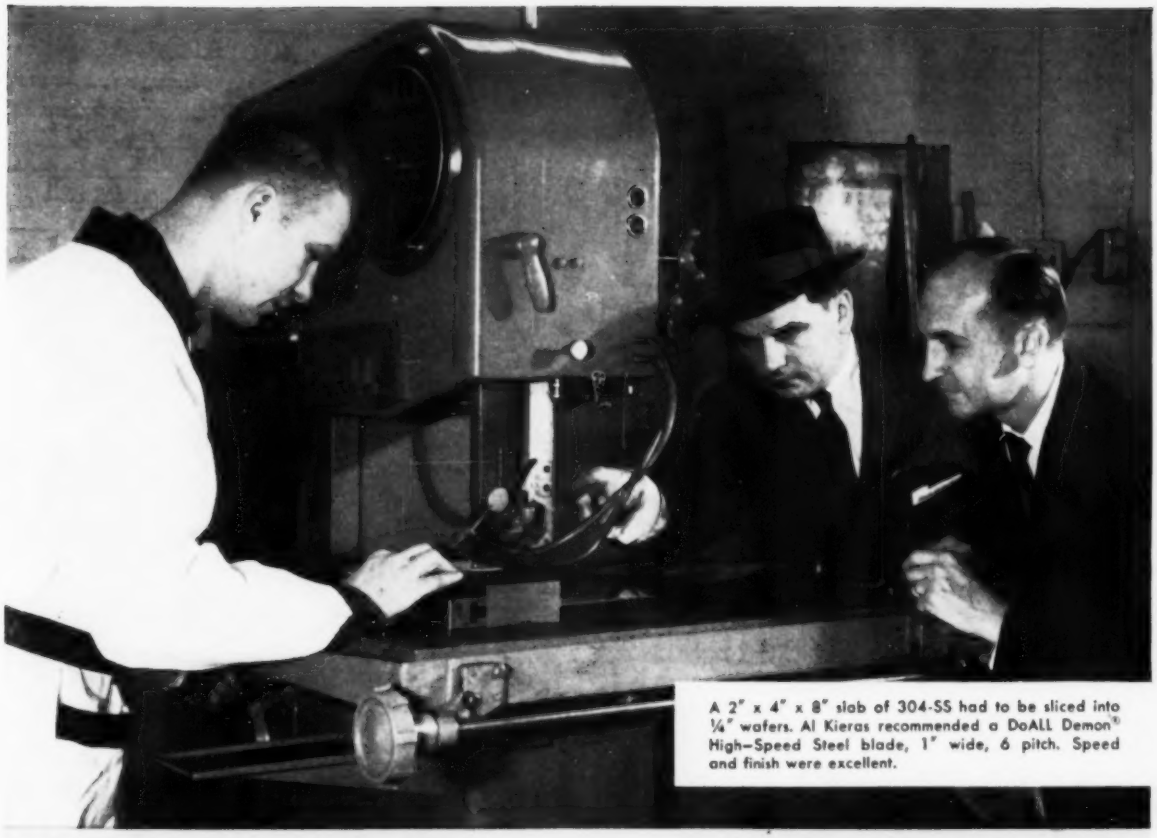
Under the cover of the Time-Master *, . . . profits in 97 holes.



*Registered trademark of Dictaphone Corporation

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, IND.



A 2" x 4" x 8" slab of 304-SS had to be sliced into ¼" wafers. Al Kieras recommended a DoALL Demon® High-Speed Steel blade, 1" wide, 6 pitch. Speed and finish were excellent.

# DoALL Sells Machines and Blades, but its **EXPERT HELP IS FREE!**

It takes more than a fine band machine and a perfect blade to get top efficiency in your band sawing. It also takes specialized knowledge to select the proper blade, feed, speed, coolant, etc. This is the expert help that you get FREE from your DoALL Sawing Specialist. Here's an example:

When Al Kieras, Sawing Specialist of DoALL Boston Company, was called in by Thomas J. Melsky, president of Melfore Machine Company, Inc., Boston, he was able to solve the sawing problem described above. His recommendations resulted in top production at lowest cost.

Back of Al Kieras and every one of the 200 DoALL Sawing Specialists are (1) years of special training, (2) the combined experience of all DoALL Sawing Specialists and the DoALL Sawing Research Laboratory, and (3) the largest assortment of band tools made—18 types and over 300 width-pitch-set combinations.

Yes, DoALL makes and sells the best machines and blades, but its expert help is free. Call your local DoALL Sales-Service Store today. Ask for a Sawing Specialist to call on you. He has helped others. He can help you. His expert help is free—without obligation.

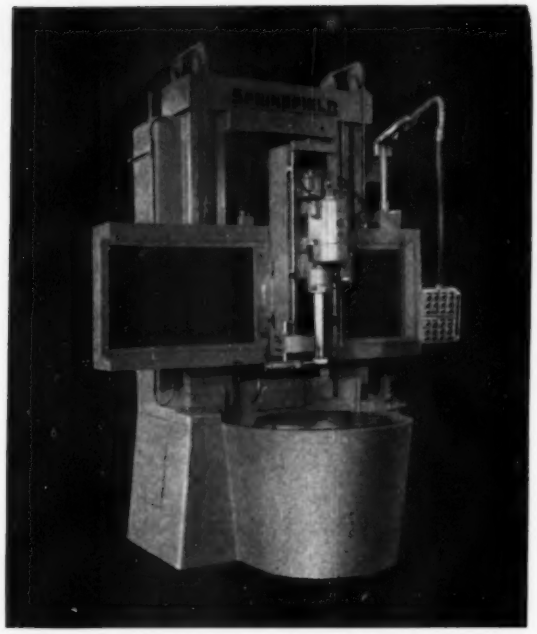
**FREE!** "Saw Blade Selector Chart" helps operators improve their sawing techniques . . . get this wall chart from your local DoALL store.

S8-68

## The DoALL Company, Des Plaines, Illinois

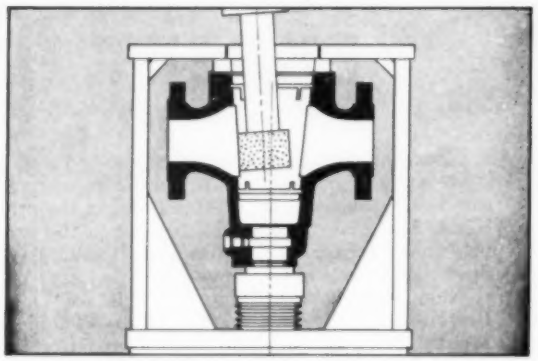
Call Your DoALL Service-Store

# Vertical grinding tapers profitably



**Standard vertical grinder** above is typical of those used by leading manufacturers of large valves for grinding internal taper seats. Profits are made because set up time is fast; for example, it takes about five minutes to change over from grinding 18″ valves to 10″ valves. The inherent rigidity of the machine is made doubly effective by gravity. Valve, fixture, and face plate are supported on a heavy *vertical* work spindle which promotes accuracy, precise concentricity, and extremely fine micro-inch finish.

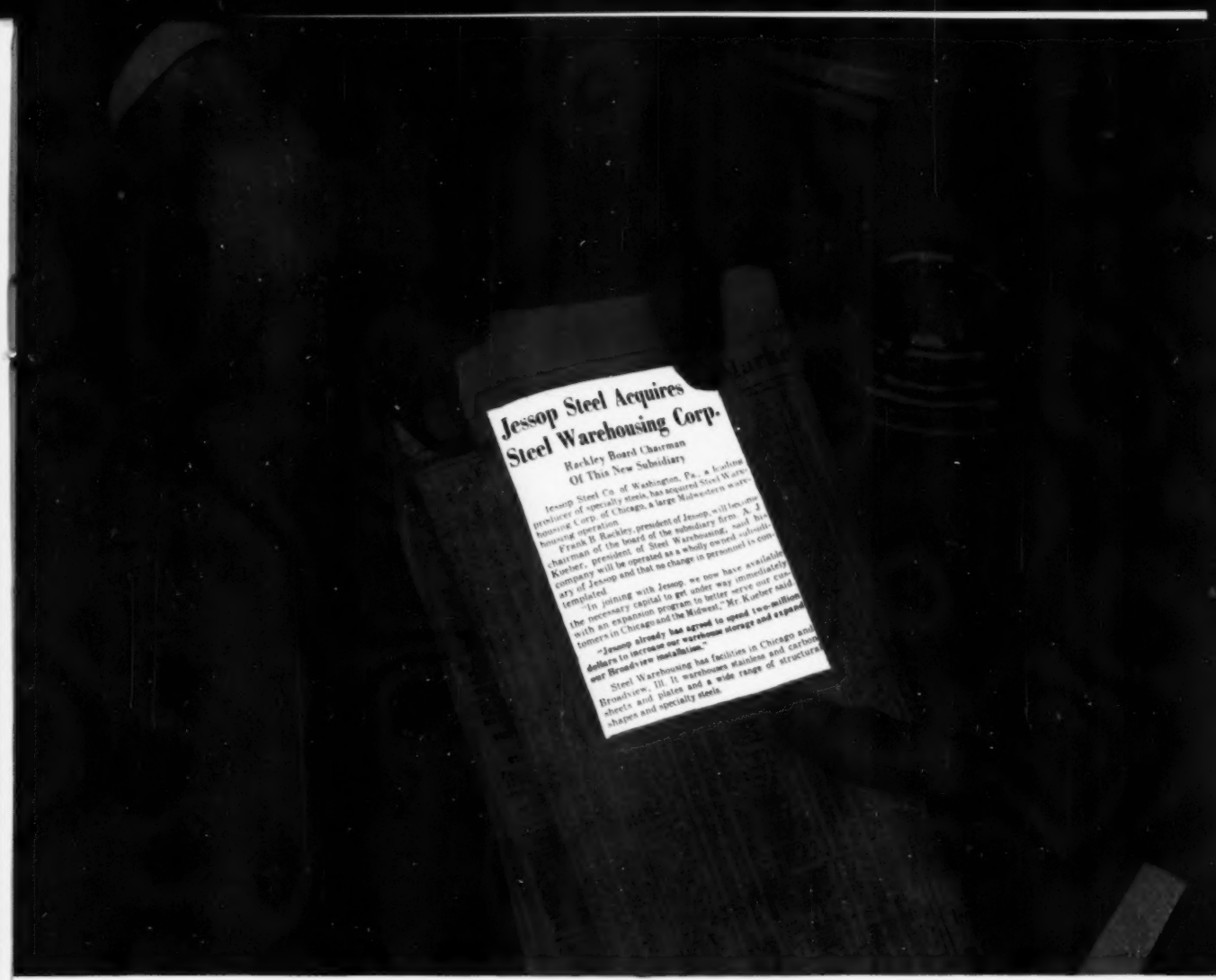
**SPRINGFIELD**



**Internal valve tapers,** as shown above, are fast payoff jobs on a Springfield Vertical Universal Grinder. On this valve taper, stock removal is 0.020″ with a requirement for 85% blue or better on a taper gage. Surface finish is held well within the 30 RMS specified. Machine swings to 52″, grinding holes from 2″ to 42″ dia., 24″ deep in irregular or regular shaped work pieces.

Not limited to internal or exterior tapers, a Springfield grinds efficiently on O.D. and I.D. shoulders, offsets, undercuts, irregular holes, and mating angles—usually in one chucking.

A few production and toolroom men turn to a Springfield because there's no other way to do the job. Most turn to a Springfield because it's the most profitable way to do many jobs. Write today for Bulletin No. 197-D. The Springfield Machine Tool Company, Springfield, O.




# Jessop buys Steel Warehousing Corporation . . . another reason for your confidence!

When you specify Jessop specialty steels, you've got good reasons for that decision. For example . . .

**With Jessop, you're dealing with success.** Although it's only two years since the acquisition of Green River Steel, Jessop now adds Steel Warehousing of Chicago. Already a two million dollar expansion of warehousing facilities is underway.

**This fast growth didn't just happen.** It results from the Jessop policy of producing the highest quality specialty steels *and keeping delivery promises!*

Yes, you have good reasons to be confident when you specify Jessop.

VMA 6721

**JESSOP**
STEEL COMPANY
Washington, Pennsylvania

**Subsidiary Companies:**

Green River Steel Corporation, Owensboro, Kentucky
Jessop Steel of Canada, Ltd., Wallaceburg, Ontario
Jessop Steel International Corporation, New York City
Steel Warehousing Corporation, Chicago and Broadview, Ill.

Stainless, alloy, tool, cast-to-shape, and forging steels; precision ground flat stock, and other specialty steels

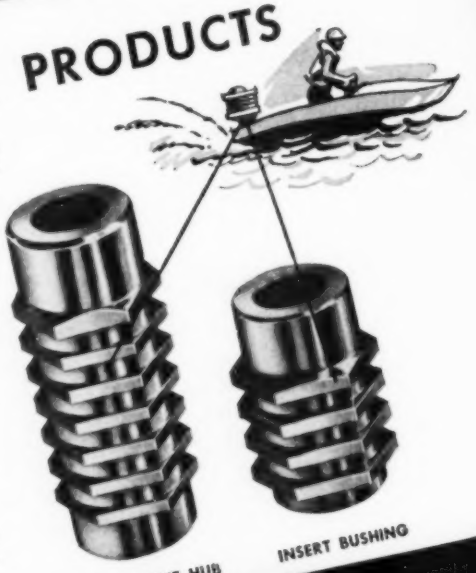
CIRCLE 249 READER SERVICE CARD

# *two typical cases where* MUELLER BRASS *determined the best and most*

CASE HISTORY 1750

## SCREW MACHINE PRODUCTS for outboard motors

Mueller Brass Co. Methods Analysis Engineers, after careful consideration of every aspect of the job requirements, found that the best method of producing these 2 outboard motor parts at the lowest cost was as screw machine products made from hollow hex rod. The insert drive hub and insert bushing are used in the lower units of one of America's most powerful outboards and must absorb constant punishment without failing. Mueller Brass Co. has one of the world's largest automatic screw machine departments fabricating both ferrous and non-ferrous custom parts. Parts can be produced in an infinite variety of shapes and sizes from ⅛" to 3¼" in a wide range of free cutting and specialized alloys. Complete facilities are available for all secondary and finishing operations, as well.



INSERT DRIVE HUB

INSERT BUSHING

## THE MAN FROM MUELLER BRASS CO.

can give you sound, unbiased advice on the one best method of making your parts because Mueller Brass Co. is the only fabricator in the country offering all these methods of production. An experienced "Methods Analysis Department" has at its command a complete knowledge of the advantages and limitations of each production process. This unique technical service is your assurance of getting the best product at the best price . . . made the one best way.

FORGINGS

PLASTIC INJECTION MOLDING

# MUELLER BRASS CO.

# CO. METHODS · ANALYSIS · SERVICE

## *economical method of producing parts*

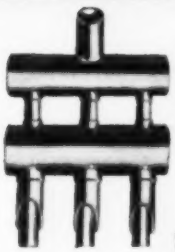
CASE HISTORY 226

### COLD-PREST® IMPACT EXTRUSION for door closer cylinder

By producing this door closer cylinder as a Cold-Prest Impact Extrusion, several important advantages are realized: formerly made in three pieces, the part is now made as one piece in one operation which eliminates machining and assembly operations. The possibility of leakage is eliminated and the part has better physical properties, as well as a smooth, bright finish. Mueller Brass Co. has complete facilities for producing Cold-Prest impact extrusions of aluminum, copper, brass, bronze and steel. Square, rectangular and cylindrical shells up to 28" in length are possible depending on wall thickness and other design details. Parts can be designed having ribs, flutes, splines or bosses . . . with multiple wall diameters and with various wall sections.

POWDERED METAL PARTS

SAND CASTINGS



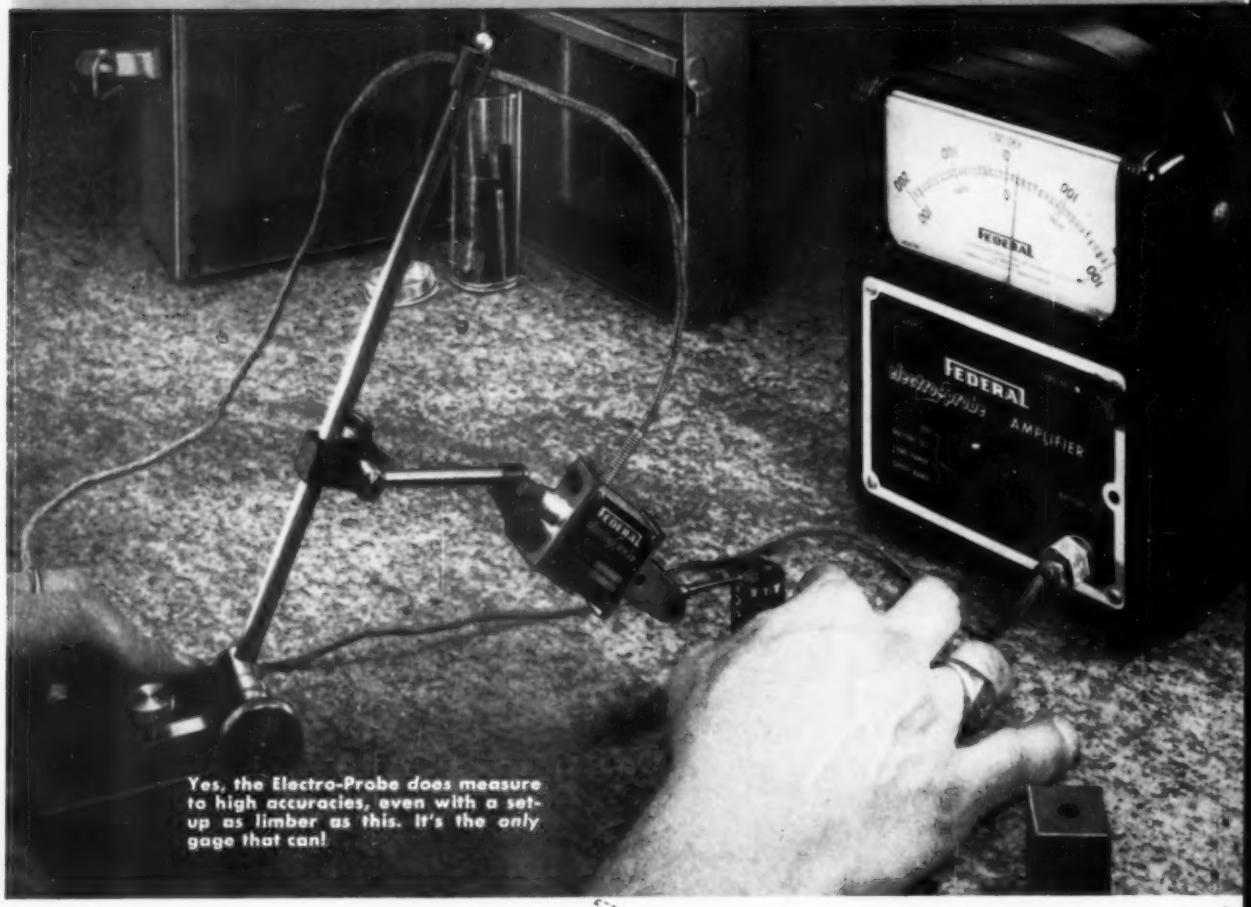
FORMED COPPER TUBE

**Write today** for engineering manuals covering all these production processes.

**PORT HURON 24, MICHIGAN**

270

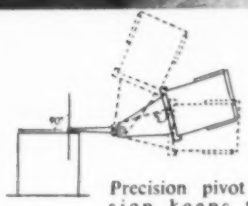
# electro-probe.




Yes, the Electro-Probe does measure to high accuracies, even with a set-up as limber as this. It's the *only* gage that can!

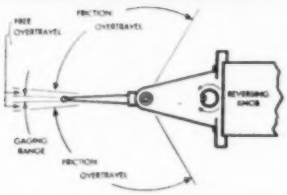
**1** By far the lowest contact pressure of any electronic gage . . . only 2.5 grams . . . a precision touch so light that you can gage *dependably, in the shop* without the need for highly rigid, heavy-weight stands. Only with the Electro-Probe do you get high accuracy gaging using an ordinary test set or other *easily* available fixture.

**2**



Precision pivot design keeps this feather-light pressure virtually constant throughout range to maintain necessary gaging accuracy (change is less than 0.1 gram per .001" of contact travel). This pressure uniformity is found only in the Electro-Probe. AND only in the Electro-Probe is this pivot point properly located so that magnification *remains constant* with changes in gage head position.

**3**




You can use the Electro-Probe anywhere safely and conveniently. Gage head and cord are impervious to oil and water. Contact can be positioned anywhere within arc of over 200° and is clutch-mounted for complete overtravel protection. Small ball tip on contact lets you check where other electronic gages cannot. Other size tips available.

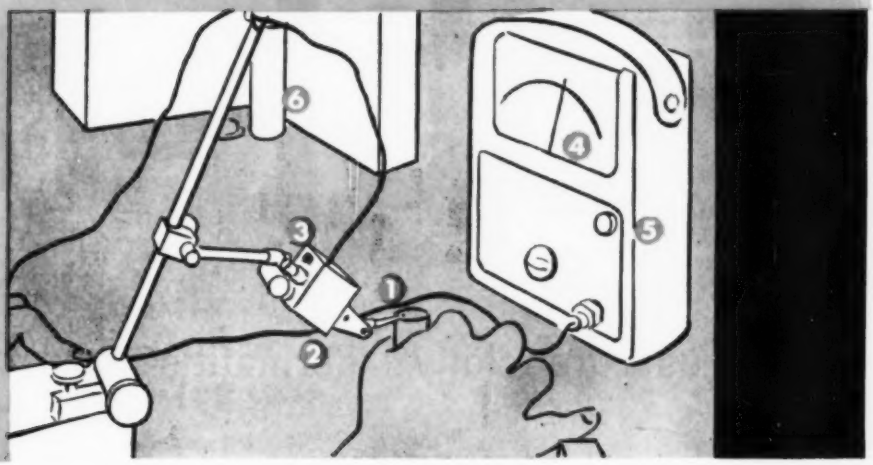
## *Ask* FEDERAL *First*

**FOR RECOMMENDATIONS IN MODERN GAGES . . .**

**Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging**

# the original and still by far the best low cost, portable, electronic gaging unit

ITS *feather light* TOUCH MAKES THE BIG DIFFERENCE

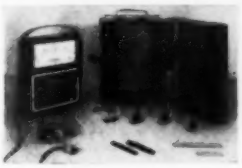



**4** Wide view dial has accurately calibrated, clearly marked scales. Pointer is needle thin for precise, unconfused readings. You choose any two magnifications you want from 100 X to 10,000 X. Lowest magnification gives you ± .020" range and .001" min. grad.: highest gives ± .0002" range, .000010" min. grad. Lightweight amplifier uses high-reliability transistors that outlive vacuum tubes 20 or 30 to 1. Mercury cell batteries provide long life, constant voltage, drift-free operation; give you an *electronic* gage which has *instant* start up. No slow-charge batteries and dangling AC cords to impair its use and portability.

**5**

Wide range electrical zero adjustment lets you set-up quickly, without the need for close, time-consuming mechanical adjustment of the gage head. For convenience, zero settings and readings coincide on both scales. Printed wiring is rugged and mounted on extra-thick, heavy duty card to give you lifetime dependability.

**6**



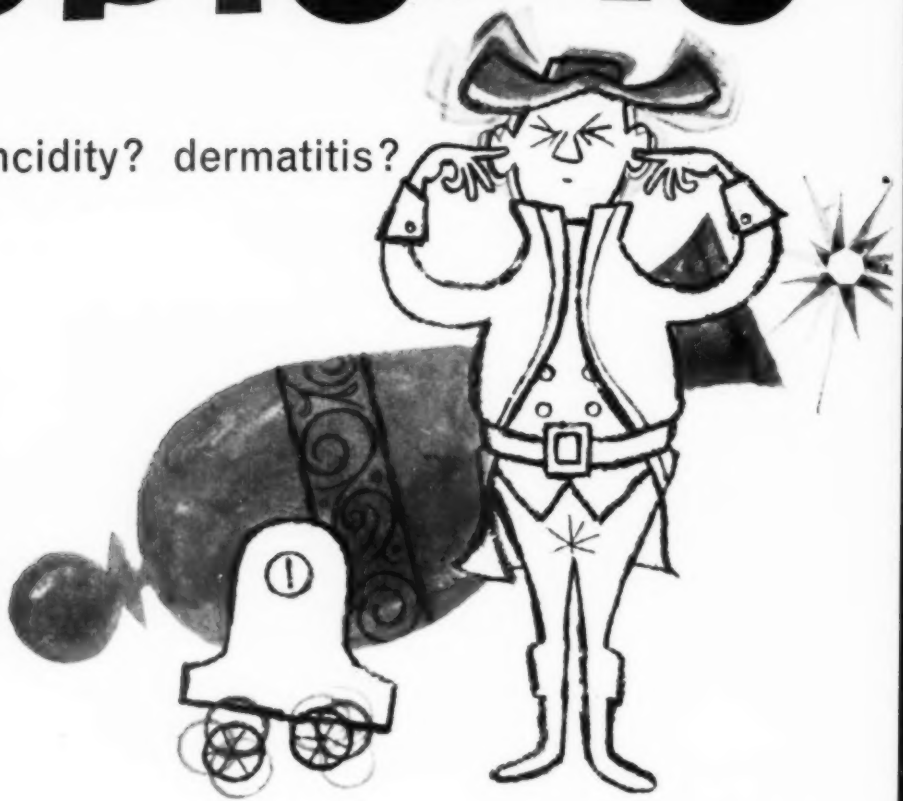
The Electro-Probe is truly a gaging UNIT — comes equipped with holding bars and rods, plus swivel clamp and variety of backs — all you need for mounting the head on available test-set stands and similar fixtures. The gage head, self-powered amplifier and accessories are packaged for portability in one lightweight metal carrying case . . . and the Electro-Probe has the lowest price tag of any comparable instrument, even those that provide only a gage head and amplifier!

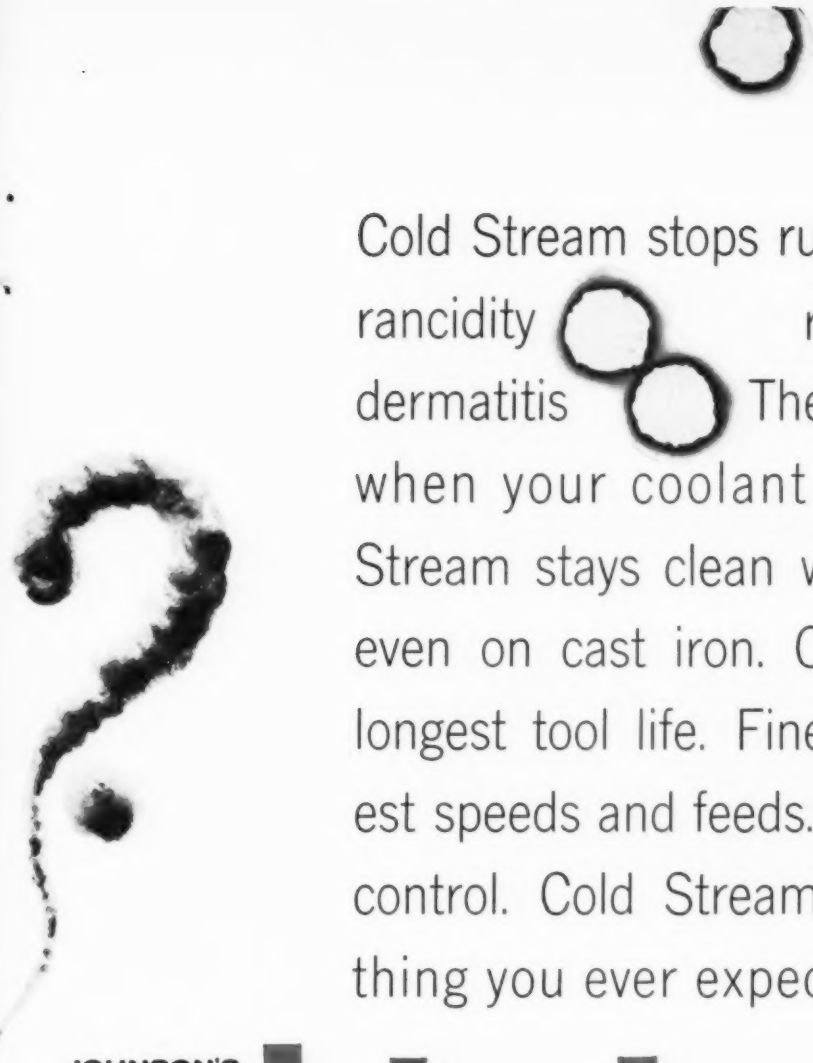
**Want a demonstration? . . . gladly, at your convenience.**

*Brochure available, write . . .* **FEDERAL PRODUCTS CORP.**
**9125 Eddy Street, Providence 1, R. I.**

# coolant problems

rust? rancidity? dermatitis?





Cold Stream stops rust resists rancidity reduces causes of dermatitis These problems start when your coolant gets dirty. Cold Stream stays clean week after week—even on cast iron. Cold Stream gives longest tool life. Finest finishes. Highest speeds and feeds. Best dimensional control. Cold Stream gives you everything you ever expected in a coolant!

JOHNSON'S

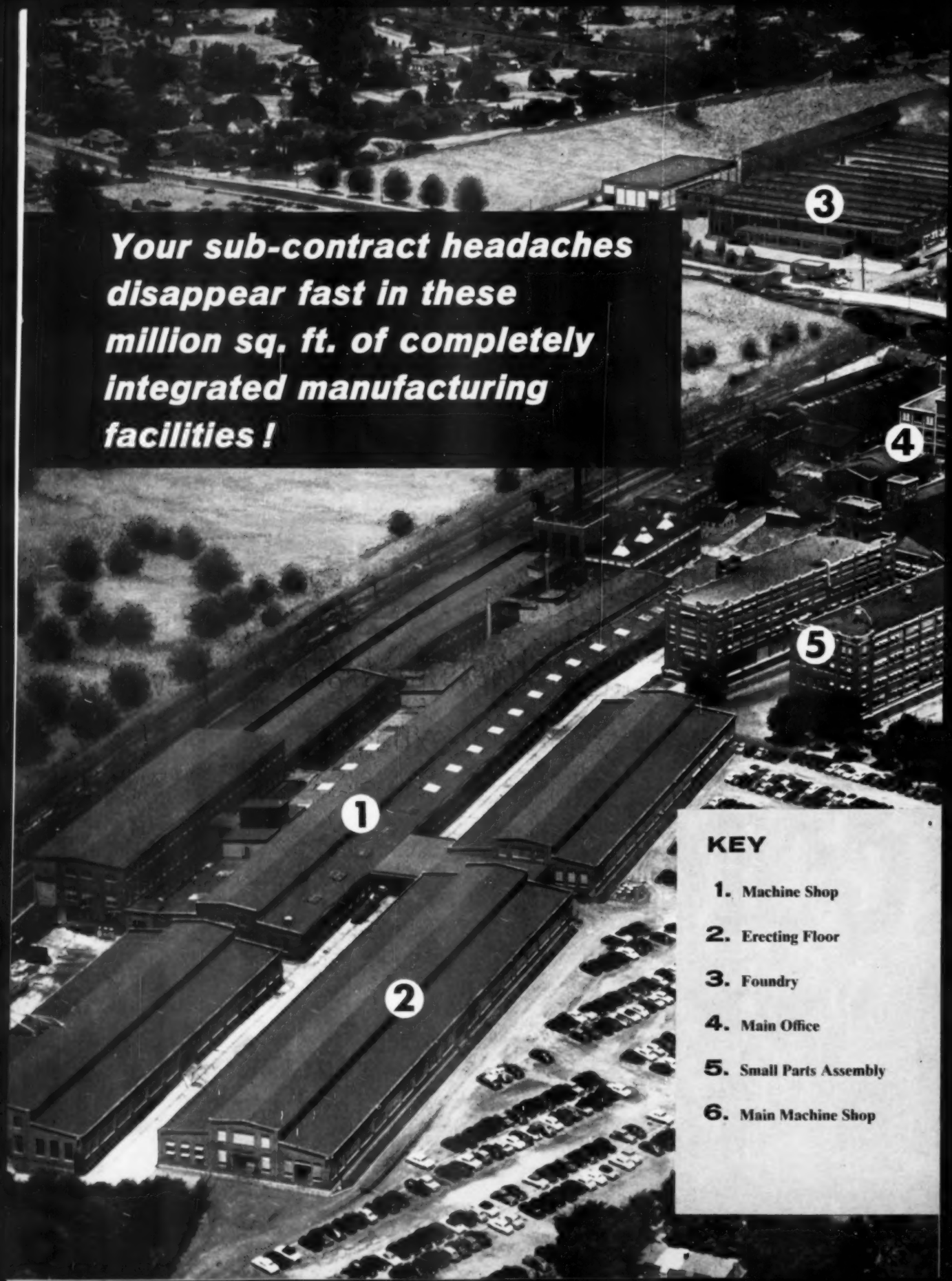
# cold stream

Stays clean week after week and gives you all the performance you pay for.

JOHNSON'S WAX

**For information, see your local Johnson industrial distributor.**

"Cold Stream" and "Johnson's" are trademarks of S. C. Johnson & Son, Inc., Racine, Wisconsin


Your sub-contract headaches disappear fast in these million sq. ft. of completely integrated manufacturing facilities !
1
2
3
4
5
KEY
1. Machine Shop
2. Erecting Floor
3. Foundry
4. Main Office
5. Small Parts Assembly
6. Main Machine Shop

Nothing's quite so important in sub-contracting as *single* responsibility . . . one single responsible source that you can depend on for quality, accuracy, and on-time delivery of your components, assemblies and complete machines.

You get all this when you work with one of the world's largest, most modern and completely integrated manufacturers, whose 65 years' experience in precision (tolerance to 10ths) manufacturing is available to you *now*, on either a short or long-term basis.

Textile Machine facilities include 1200 *modern* machine tools of all types and sizes, a completely mechanized foundry (one of the country's largest), 3000 skilled craftsmen, including a corps of the industry's top designers and engineers.

Combine these facilities with electronic punch card production scheduling controls and quality control techniques—and you've got the perfect answer to all your sub-contract problems . . . right *under one roof*.

For more details, or for latest Facilities File Folder, call or write:

**TEXTILE MACHINE WORKS**

*Contract Division • Reading, Pennsylvania*

LOOK FOR THIS SIGN

CAPEWELL

*for fast, dependable service on*

- hand hack saws
- power hack saws
- band saws
- hole saws
- hammers
- ground flat stock

LOOK FOR THIS SIGN

INDUSTRIAL DISTRIBUTORS · SERVING INDUSTRY ECONOMICALLY · THE RIGHT HAND OF PRODUCTION

for fast, dependable service on all your industrial needs.

Patronize the Distributor who displays both.

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

# Letters...

To American Machinist
330 W 42nd St, NY 36, NY

## True-Position Tolerancing

In the bibliography at the end of a series of Reference Book Sheets on "Geometrical and True-Position Tolerancing," published in AMERICAN MACHINIST (June 16, 1958 to October 22, 1958), Professor Fred L Spaulding of the University of Illinois was given credit as one of the sources by the author, Walter H Harrington. Because of Mr Harrington's extensive reliance on Professor Spaulding's paper, presented at a seminar at the University of Wisconsin in 1956, for much of the data set forth in some of the Reference Book Sheets, the editors wish to acknowledge the author's special debt to Professor Spaulding over and beyond the listing of his name in the bibliography.

## Nickel coins

Dear Sirs:
I would not presume to argue or disagree (entirely) with a man of knowledge, but nevertheless, I consider your article on nickel coinage (*AM*—Jan 26 '59, p87) a trifle misleading, mainly in reference to Argentine coinage and the Canadian five-cent piece.

I am under the impression—studying the Argentine coins before me—that until the end of 1958 the coins were iron plated. However, the conclusion to be drawn from the article is that this is a nickel-copper alloy. This is surely quite incorrect.

As far as the Canadian five-cent pieces are concerned, the nickel type alternates every few years with one of steel. Once again, your article gives a wrong impression: that every Canadian five-cent piece is struck in nickel.

This is also quite incorrect. I quote the dates for steel five-cent pieces: chrome steel, 1944-45; steel, 1951-54.

Excuse this seeming presumption on the part of an English housewife. Perhaps I should leave engineering technicalities to the male mind—(and my husband's magazines alone?)—but I happen to be intensely interested in coins and therefore metal alloys.

Mrs R E M Pearce
*Rayleigh, Essex, England*

*We've asked The International Nickel Co, Inc, to comment on Mrs. Pearce's letter:*

"The instances mentioned in the short article should be construed

## SHOPMATES

*N. Jarvis*

YOU DON'T HAFTA SHOW ME WHERE T'HANG NOTHIN'!! I WORKED HERE ONCE BEFORE ... BOSS MADE LIFE SO MISERABLE I QUIT — BEEN TOLD HE AIN'T HERE NO MORE ... FAT FELLA ... BALD — CHECKERED VEST — THE DIRTY
I TOLD HIM!
THEY DESERVE EACH OTHER!
N. JARVIS

## *When you buy Motor Starters--*

# YOU PAY FOR OVERLOAD PROTECTION

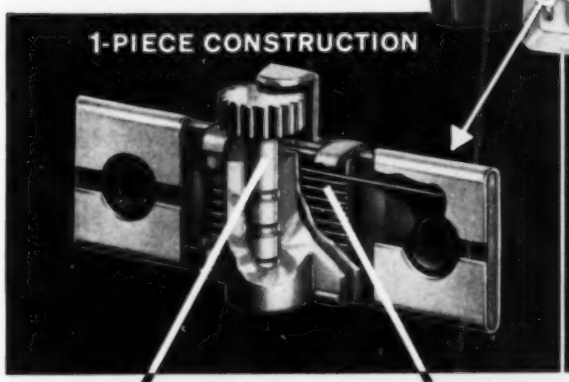
**Only ONE-PIECE Overload Relays give 100% Protection** • Only with ONE-PIECE construction can you *know* you've installed the heater correctly. Only with ONE-PIECE construction can you *know* the heater is exactly centered, or properly positioned, so that it performs according to its rating. Only with ONE-PIECE construction can you *know* your motors have full protection.

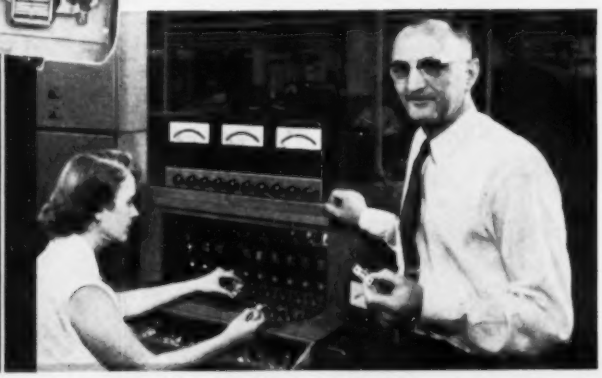
**Only Square D has ONE-PIECE Construction** • ONE-PIECE construction *eliminates* any possibility of heater misalignment. Square D melting alloy thermal overload relays can be installed only one way. They are tamperproof. They are factory-assembled, are *individually* calibrated and tested. Repeated tripping will not affect accuracy.

*Insist on Square D melting alloy thermal overload relays*

***Write** for Bulletin SM-275 for the complete story on Square D starters with ONE-PIECE thermal overload relays. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.*

# ...BE SURE YOU GET IT!



**Heat-responsive element** (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

**Heat-producing element** is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

**Individual factory inspection** of every Square D melting alloy thermal overload relay means performance you can trust. Each unit is calibrated and thoroughly tested to make sure it will perform according to its rating.

**EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE**

**SQUARE D COMPANY**

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

NOBLEWEST *Precision*

ROLL GRADUATING MACHINES

WHEREVER machines and instruments require precisely graduated dials or collars for accurate setting, Noblewest equipment provides the fastest and lowest cost production method. Employing the famous **Noblewest Roll Marking Process** these machines graduate and number each piece **with machine tool accuracy** in a matter of seconds. Both graduations and numbers are **permanently indented** . . . easy to color fill . . . last as long as the part itself. Model 460, illustrated, is equipped with a unique electro-pneumatic control system for fully automatic operation. It will graduate and number dials and collars up to 7" diameter with precision and uniformity at a fraction of the cost of any other method. Can be tooled for tapered dials to approximately 20 degrees. Noblewest also manufactures **linear** graduating machines that will accommodate lengths up to 3 feet at a production rate of 25 fpm. For complete information and catalog, write **Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.**

Noblewest graduating and scale dies are made with micro-precise accuracy. You can't buy finer . . . yet they are competitively priced.

*A few desirable territories open to qualified representatives.*

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

MARKING
NUMBERING
EMBOSSING
GRADUATING

as a trend toward a wider use of nickel for coinage alloys as a consequence of the improved availability of that metal in the last two years. It was the shortage of nickel that can be considered responsible for the temporary switch from nickel to chromium-plated steel (1944-45) in the Canadian five-cent piece. Except for that short period all Canadian five-cent pieces were and continue to be struck in pure nickel.

In respect to Argentina, the same war-time shortage compelled its Central Bank to abandon the earlier cupro-nickel and resort to aluminum bronze. Here the return to a nickel-containing material was initiated in 1950 with the San Martin centennial pieces. In 1958, with the adoption and issue of the one-peso coin, the process was completed for all denominations.

Incidentally, the term "iron plated" is a misnomer for the metal of which these Argentine coins are made. It is more fitting to call it "nickel-clad steel." It consists of a mild steel central layer clad with 5% nickel on each side. No plating is involved.

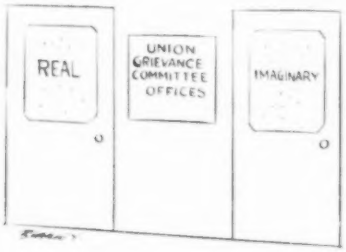
John W Moran, Jr
*The International Nickel Co, Inc*

## Transmitting card data

Dear Sirs:
As a regular reader of your magazine, we read on the "Spot News" page about a new system by which punched-card data can be transmitted over an ordinary telephone line. (*AM*—Jan 26 '59, p77). The system, according to your article, was developed by Western Electric, and we are very much interested in learning more about it.

H Kittel
*Villingen-Scharzwald*
*Germany*

*Additional information can be secured by writing to Mr C L Strong, Western Electric Co, 195 Broadway, New York 7, NY*—Ed.



## CALENDAR

**Design Engineering Show** — May 25-28, Convention Hall, Philadelphia, Penna.

**American Society for Quality Control** — National Convention and Exposition, May 25-27, Public Auditorium and Hotel Cleveland, Cleveland, Ohio.

**American Gear Manufacturers Association** — Annual Meeting, May 31-June 3, The Homestead, Hot Springs, Va.

**Material Handling Institute** — National Exposition, June 9-12, Public Auditorium, Cleveland, Ohio.

**National Association of Metal Finishers**—Annual Meeting and Convention, June 14-16, Statler-Hilton Hotel, Detroit, Mich.

**American Society of Mechanical Engineers**—Semi-Annual Meeting, June 14-18, Chase-Park Plaza Hotel, St. Louis, Mo.

**Society of Automotive Engineers** — Summer Meeting, June 14-19, Chalfonte-Haddon Hall, Atlantic City, NJ.

**Drop Forging Association** — Annual Meeting of Members, June 21-24, Essex and Sussex Hotels, Spring Lake, NJ.

**American Society for Testing Materials**—Annual Meeting, June 21-26, Chalfonte-Haddon Hall, Atlantic City, NJ

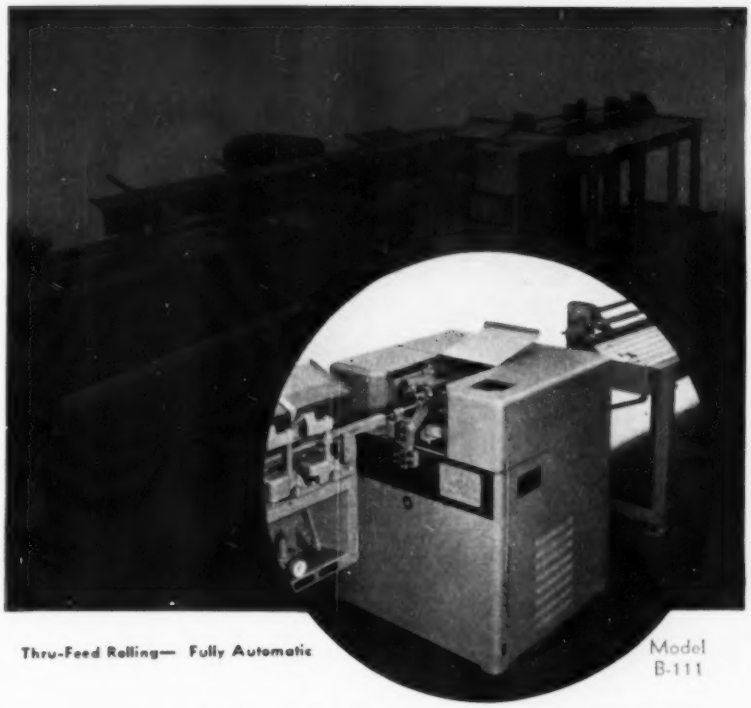
**Pressed Metal Institute**—National Meeting, Sept 13-17, Stanley Hotel, Estes Park, Colo.

**Society of Automotive Engineers** —Farm, Construction, and Industrial Machinery Meeting and Display, Sept 14-17, Milwaukee Auditorium, Milwaukee, Wis.

**American Die Casting Institute**—Annual Meeting, Sept 15-17, Edgewater Beach Hotel, Chicago, Ill.

**Instrument Society of America** — Instrument-Automation Conference & Exhibit, Sept 21-25, Int'l Amphitheatre, Chicago, Ill.

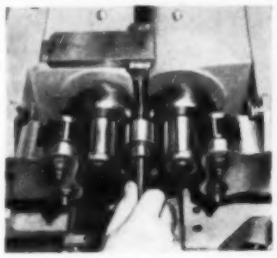
**American Welding Society**—National Fall Meeting, Sept 28-Oct 1, Sheraton-Cadillac Hotel, Detroit, Mich.

Thru-Feed Rolling— Fully Automatic Model B-111

# .... for Production or Job lot Threading and Form Rolling

In-Feed Rolling— Fully or Semi-Automatic



In-Feed Rolling— Manual loading

## REED Two-Die Type Cylindrical Die Thread Rolling Machines

The flexibility of the Reed B-111 machine provides for the most economical selection of equipment to suit job lot or quantity production requirements.

Standard machines are available for in-feed or thru-feed rolling or a combination of both for a wide range of thread and form rolling applications. Precise micrometer die and work positioning adjustments assure continuous production of uniform accurate threads and forms.

*Write for Machine Bulletin B-111-1*

REED TRM-173

**REED ROLLED THREAD DIE CO.**

*Specialists in Thread and Form Rolling Tools and Equipment*

HOLDEN, MASSACHUSETTS, U. S. A.

**Sales Offices** in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

CIRCLE 261 READER SERVICE CARD

THE GAGE THAT REMEMBERS

**Use a Pipe Machinery "CORRELCHEK" for faster, more accurate, and complete inspection of pipe threads (ANPT, NPTF, NPT and NGT)**

Simple to operate:—

Set the instrument with Master Gages.

Check product to the proper tolerances indicated by color zones on the dial.

Torque controlled to prevent over exertion of pressure by inspectors.

Eliminate discussions and arguments.

Write today for full details.

PATENT NO. 2,833,053

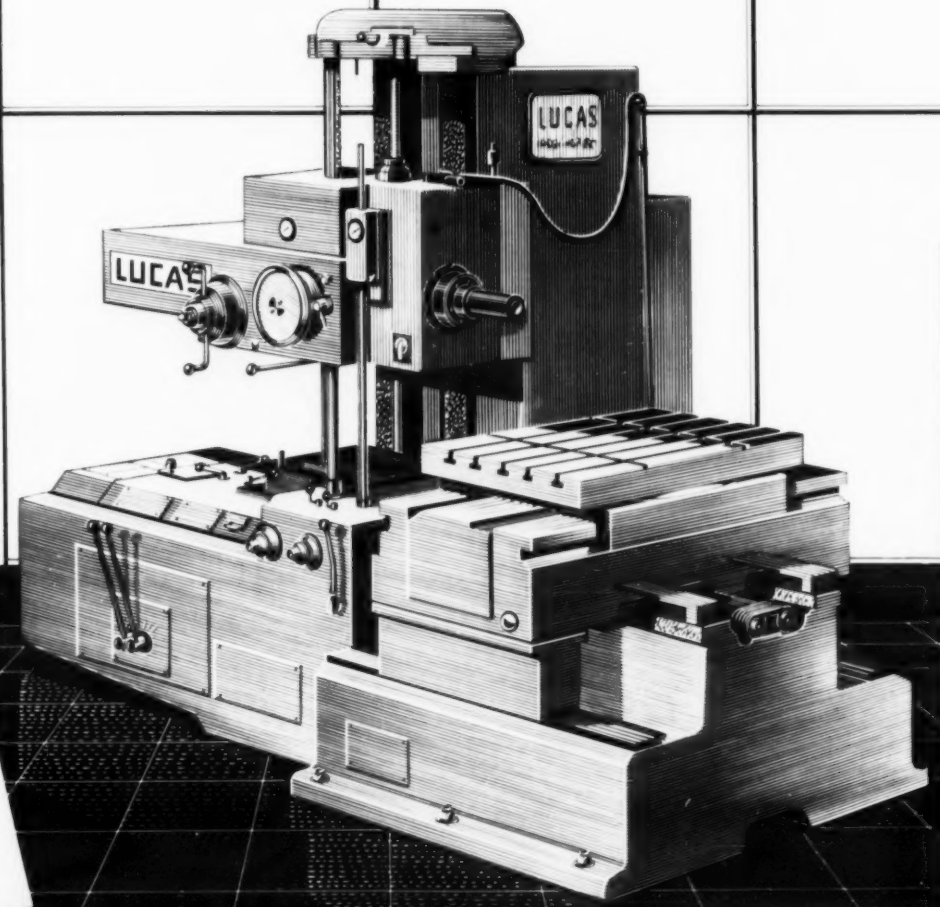
THE PIPE MACHINERY COMPANY

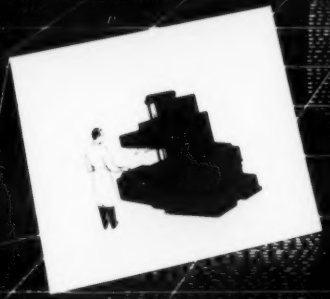
29100 Lakeland Blvd. • Wickliffe, Ohio

Greater Cleveland

# newest and smallest in a distinguished line

LUCAS OF CLEVELAND



The new Lucas Horizontal Boring, Milling and Drilling Machine offers all the quality construction features of the other fine precision machines in the Lucas line plus a built-in Rotary Table. This versatile little machine is made-to-order for production of small dies, fixtures, miniature electronic parts, machine casings, aircraft and missile parts and similar work. The inherent accuracy of the Lucas 275-40-RT suits it for a variety of post-production inspection operations. Air Lift to saddle and table. Constant-operating automatic lubrication. Spindle diameter 2.750″ or 3.000″. Spindle travel 18″. Vertical Head travel 24″. Cross travel 30″. Longitudinal Saddle travel 18″. Table 26″ x 30″. Spindle speeds 62-2000 rpm. Feeds from .0007″-.915″. Tape programming can be added as an optional feature. For complete information, write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

# LUCAS plus "N. P. C."

Numerical Positioning Control on any Lucas machine presents advantages that contribute to more production, greater efficiency and a higher degree of accuracy. The individual advantages are as follows:

- Reduces direct and indirect labor
- Eliminates jigs and fixtures
- Eliminates scrap
- Controls production
- Improves quality
- Reduces inventory
- Reduces floor space
- Reduces tool costs
- Simplifies engineering methods
- Makes new methods possible
- Eliminates the human error

On all Lucas machines with N.P.C., the point to point positioning and changes of speeds and feeds may be controlled by manual selection of the decade switches on the console as well as by punched tape programming.

It will pay you well to investigate the possibilities which this combination offers in your plant. For complete information, write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

**LUCAS**
OF
**CLEVELAND**

# SPOT NEWS...

- **Small car concept may soon be applied to trucks by Detroit's Big Three** automotive manufacturers. Reason is growing popularity of the small European truck here. (Volkswagen alone will sell about 24,000 here this year.)
- **Complete plant for precision machining of beryllium parts** has just been opened at Valley Stream, LI, N Y, will produce custom-machined electro-mechanical components for the U S missile and space research program to tolerances of 0.000,025 in. Operators wear disposable clothing, eat inside the building, are under constant medical surveillance. Each piece of fabricating equipment has its own closed-circuit exhaust system.
- **California has just refused to pass a $1.25-per-hour minimum wage.** But it's virtually assured now that the state will pass a "package" workmen's compensation increase (higher weekly compensation for injured-on-the-job workers, higher death benefits for survivors of killed-on-the-job workers) that will cost the state's employers an additional $25 million a year.
- **A Swedish lathe, a single-spindle drillpress and a small radial drill,** plus an Italian ultrasonic drilling machine are the only machine tools on exhibit at the United States World Trade Fair in New York, May 8-19. Czechs, who showed machines last year, aren't doing so this year.
- **Air-launched ballistic IRBM missile, the Bold Orion,** will be designed and built by Douglas Aircraft. Contract went to Douglas over scores of bidders. The Bold Orion will have a 1000-mile range, will be launched by B-58 and B-70 bombers, and while cost and timing for the project haven't been set, it's expected to replace the 500-mile Hound Dog.
- **Chances are the Big Three will stick to original introduction dates** for their small cars, despite newspaper publicity to the contrary. First out will be GM's "Corvair" on September 9 (if some welding snags have been cleared up by then). Then comes Ford's "Falcon" sometime during the first two weeks in October; followed by Chrysler's "Valiant" in early November.
- **In an effort to stockpile warehouses before the threatened steel strike,** trucks are reported hitting the highways overloaded by as much as nine tons each. Situation has gotten so bad in Indiana, that the Governor plans to add more inspectors, take other drastic measures.
- **High-density polyethylene plastics are about to make significant inroads** on stamped sheet in certain automotive applications: one automaker is switching to plastic for side shields in 1960, figures he'll save $500,000 a year because (1) impregnated colors in the plastic save painting, and (2) one basic manufacturing operation replaces nine trips through presses.
- **Soviet Union Exposition in the U S A,** to be held at New York's Coliseum June 30 through Aug 10, will feature highly automated machine tools.
- **Stinson Aircraft expects to sell 20,000 of its Charles Townabout** electric sports cars a year by 1960. Some 500 cars will be produced between now and year's end, after that 300 a month until April 1960, and about 2000 a month thereafter. First four models are now getting final touches.
- **New York plants are training only 30 to 40% of the skilled metalworkers** they will need in the next six years, according to a state survey. It's estimated that an average of 2900 workers must attain craftsman status each year between now and 1965 in New York state—40% of them to meet expansion needs and the rest as replacements for craftsmen who retire or die.
- **New drafting standards for metal stampings** have just been published by the American Society of Mechanical Engineers as Section 10 of the American Drafting Standards Manual. It's available from ASME, 29 W 39th St, New York, or American Standards Association, 70 E 45th St, New York.

# RUGGED PRECISE ECONOMICAL

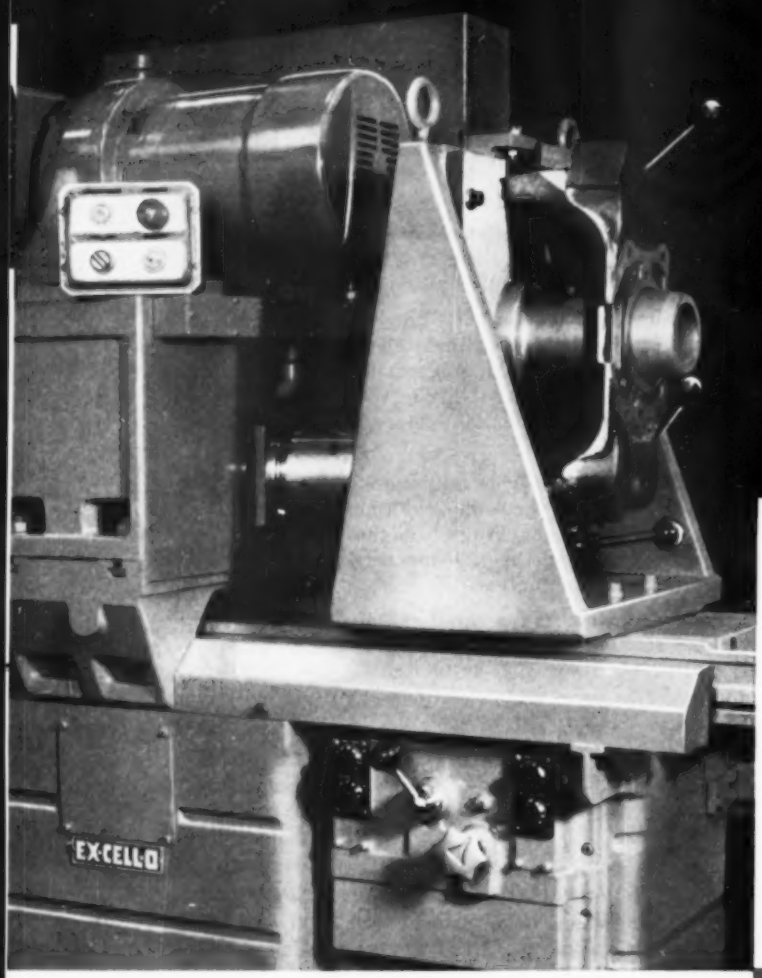
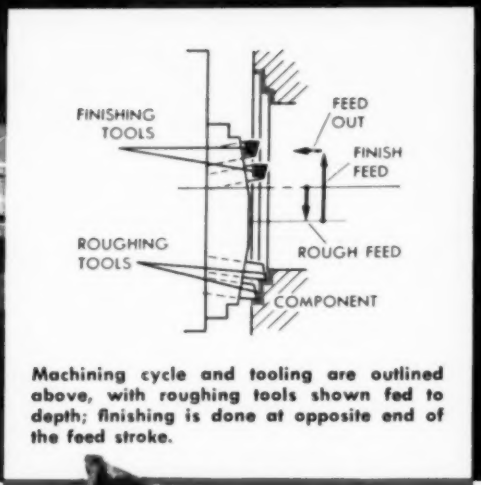



Table pad of the compact Style 2112-B provides ample space for this rugged fixture. Work is shown clamped in position.




Machining cycle and tooling are outlined above, with roughing tools shown fed to depth; finishing is done at opposite end of the feed stroke.

Starter motor mounting of this cast iron clutch housing is faced and bored from rough to finish in one cycle.

59-18

## Ex-Cell-O Style 2112-B bores, faces heavy casting in a single cycle

RUGGED for roughing—PRECISE for finishing—ECONOMICAL for short runs

Precision built for boring, turning and facing small or medium-size parts, the Ex-Cell-O Style 2112-B Precision Boring Machine is equally adept at tackling a heavy cast iron truck clutch housing.

The job is done quickly and accurately in one cycle. After clamping, rapid traverse brings the work into position for roughing tools to face two shoulders and plunge two bores. Feed is reversed for finish facing, and table feed-out doubles as a finish-bore pass. A standard hydraulically-operated Ex-Cell-O Facing Head carries the tooling.

Find out how the Style 2112-B or the double-bridge Style 1212-B can put similar flexibility into *your* operation. Write direct, or ask your local Ex-Cell-O Representative about combining these rugged, time-tested Precision Boring Machines with low-cost tooling for real economy in long runs or limited production.

EX-CELL-O FOR PRECISION XLO

EX-CELL-O CORPORATION Machinery Division

DETROIT 32, MICHIGAN

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT.

CIRCLE 265 READER SERVICE CARD

# WASHINGTON...

## Steel wages and prices...

Eight weeks of bargaining aren't going to be enough to bring the Steelworkers and the steel companies to a settlement. By all the signs, as the two sides went behind closed doors, you have to figure on a strike of some kind when the contract expires on June 30.

**The various players in the drama** of the steel negotiations are all acting out their parts for one of the biggest audiences ever—that is, the entire labor community and business community, the Executive branch of the government, and the Congress of the United States. Hence, the participants have studied their roles carefully, and are trying to work out a script that shows that they—and they alone—are justified in the final analysis in doing what they have to do.

**The profit picture of the steel companies** puts them at a disadvantage publicitywise. The Steelworkers are using these profit figures to bolster their claim that a substantial wage increase can be paid without raising prices.

**McDonald has to make a big play** for something larger than 8 to 10¢ per hour, even if he settles for about this eventually. But the steel companies figure that they have to resist as far as possible the union's demands—in response to Eisenhower's plea for a non-inflationary wage-price settlement. This means taking a strike, which then provides the pressure the companies have to show to justify signing for whatever the eventual wage increase turns out to be.

**The strike** also would give public relations backing if the companies decide that the wage increase requires a price increase—regardless of all the pressure against it.

**The best guess:** a short strike, perhaps four or five days—but of course, there's no real way of telling ahead of time. One thing to keep in mind: any strike at all means that furnaces are out of production for three weeks or so.

**Wage agreements being signed** in the metalworking industries are following a firm pattern —around 8¢ an hour. This is about the increase being won by the Machinists from aircraft companies and by the United Auto Workers in negotiations with such farm equipment companies as Allis-Chalmers.

**The steel wage increase**—if it goes higher—will certainly set a new target for labor leaders to shoot for in every contract that comes up later.

## Capital expansion...

. . . was right at the heart of the questioning of Henry C Wallich by Senators during the hearings on his nomination to the President's Council of Economic advisers.

**Wallich, who has been top economic adviser** to Secretary of the Treasury Anderson, said firmly that (a) We have to have price stability to have stable growth (b) There's no substitute for savings to keep plant expansion high.

**Said Wallich on how to increase savings:** "One aspect is the tax mechanism. The depreciation field probably could take some improvement; that is to say, if we had more liberalized depreciation methods, we would probably increase the rate of capital formation."

**No senator took up Wallich's suggestion.** Reason: Right now, with all the talk about a boom already here and the need for balanced budgets, there's no likelihood of Congress enacting a depreciation law that would (1) stimulate business and (2) temporarily add to Eisenhower's difficulties with a balanced budget.

## Price policing...

Senate hearings on a price notification bill wound up just as the steel wage negotiations got underway. After giving U S Steel's Roger Blough and the United Steelworkers' David McDonald a forum to kick off the negotiations, the Antitrust & Monopoly Subcommittee listened to other witnesses—almost all of whom joined Blough and McDonald in blasting the proposed legislation.

**The bill would require** large corporations to give the Attorney General and the Federal Trade Commission prior notice of any price increases. FTC would then hold public hearings on the proposed boost—but a company could raise its prices 30 days after it furnished notice, without any government approval.

**FTC spokesmen** said the Commission could not handle the administrative burden it would be assigned if the bill should pass, and added that public hearings wouldn't stop price increases anyway.

**Antitruster Robert A Bicks** opposed the bill because it would (1) "substitute the pressures of public inquiry for market forces in determining price changes" and (2) it could "discourage price declines—for companies may well be loath to risk price cuts when price rises can take place only at the cost of required waiting plus public hearing."

**GE's Cordiner** said enactment of the O'Mahoney Bill would be "a major step on the road toward government controls over all of economic life," and urged a program of "constructive action" by government, unions and management to control inflation rather than restrict prices.

# How a leading automotive manufacturer Snyder-izes for the Soaring Sixties

## HOLDS PISTON WEIGHTS ± 2 GRAMS AT 600 PER HOUR

This Snyder transfer machine automatically weighs die cast aluminum pistons and mills them to tolerances of ± 2 grams at double the rate of the previous method. Here's how it turns out 600 parts per hour:

**Pistons are transferred bottoms-up to orienting station.**

**Pistons are oriented in relation to the wristpin hole offset.**

**Pistons are spun right side up (below at right) while they are advanced to weighing station.**

**Precise overweight is transmitted by memory system to weigh-mill station during transfer.**

**A 3¼" milling cutter removes excess with the piston clamped in position.**

**Gaging station re-weighs pistons to check weight. Deviation from part tolerances stops machine.**

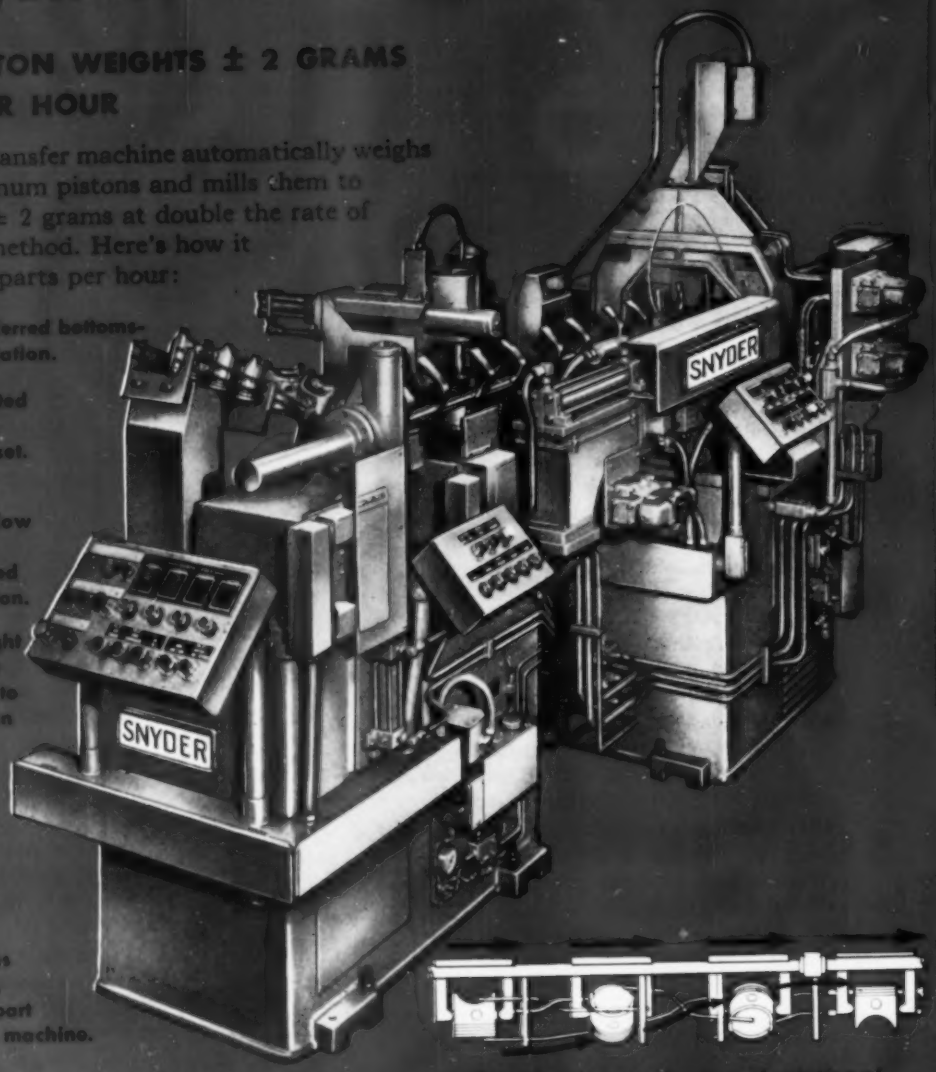



*Diagram shows end over end rotation of piston as it passes through spiral rails.*

Do your manufacturing cost problems revolve around parts handling, gaging and assembly as well as machining? Ask us to show you the benefits of SNYDER-IZING FOR THE SOARING SIXTIES. For a resume of SNYDER special machines engineered for profit opportunities, send for our new brochure or phone.

**SNYDER CORPORATION**

*(Formerly Snyder Tool & Engineering Company)*

3400 E. LAFAYETTE—DETROIT 7, MICHIGAN
Phone: LO 7-0123

# DETROIT...

## A glowing April...

Automakers hailed April as their first half-million sales month since June 1957, when 544,000 passenger cars were sold. According to Ward's, the industry's statistical agency, dealers were selling at 91% of the 1957 January-April rate. For April alone, they hit 98% and it's a climbing trend.

**Production pace stayed slightly ahead of sales.** Combined vehicle production in April totaled 694,789 units—highest monthly figure since January 1957.

**Cumulative output in 1959 through May 2** totaled 2,636,310 vehicles, including 2,206,294 passenger cars, 429,145 trucks and 871 motor coaches. During the same period last year, 1,898,088 vehicles were built—1,587,230 cars, 309,527 trucks and 1331 coaches.

**With the single exception of FWD Corp,** there is not a single vehicle maker whose year-to-date production total does not exceed 1958. Some gains are spectacular: American Motors—143,-036 vs 57,653; Studebaker—65,518 vs 12,893; Ford—547,520 vs 366,106; Edsel—17,884 vs 5528; Willys—40,302 vs 28,229; and Dodge truck—30,268 vs 19,064.

## Those honest engineers...

DeSoto's chief engineer and director of product, A E Kimberly, recently hinted that the auto industry could well afford to concentrate on some of the fundamentals still lacking in today's cars.

**"These breakthroughs,"** he said (referring to problems that have defied solution through the years) "may still come from the industry's own research. Or they may come from a clue provided by the hundreds of letters and suggestions we receive each year from interested motorists and innovators."

## Still-unsolved problems...

**Kimberly listed these as major, unsolved** problems: adequate traction on slippery surfaces, a better method of keeping windshields clean, a substitute for lead-based solder to smooth car body surfaces (the present methods are fussy and costly), reduction of headlamp glare (an entirely new principle is needed to provide effective illumination without glare and without need for adjusting headlamps for oncoming traffic), a new transparent material with all the desirable characteristics of glass but with greater strength and less weight, and more acceptable safety belts which the majority of motorists would use at all times.

**To this list,** any thoughtful owner of a current car would add locating of those items requiring periodic service (instrument panel bulbs) where they can be reached without having to dismantle the major subassembly involved. Or a garageman might well inquire why the oil pan can't be made of plastic tough enough to withstand shock and heat, but still flexible enough to allow maneuvering around chassis parts that now must be dismantled when the pan is dropped.

**The list is as long as one's imagination.** We agree with Mr Kimberly—the time is here when inventive genius should be diverted from creating complexity to the more challenging task of simplifying that which is at hand.

## A trend toward diesels...

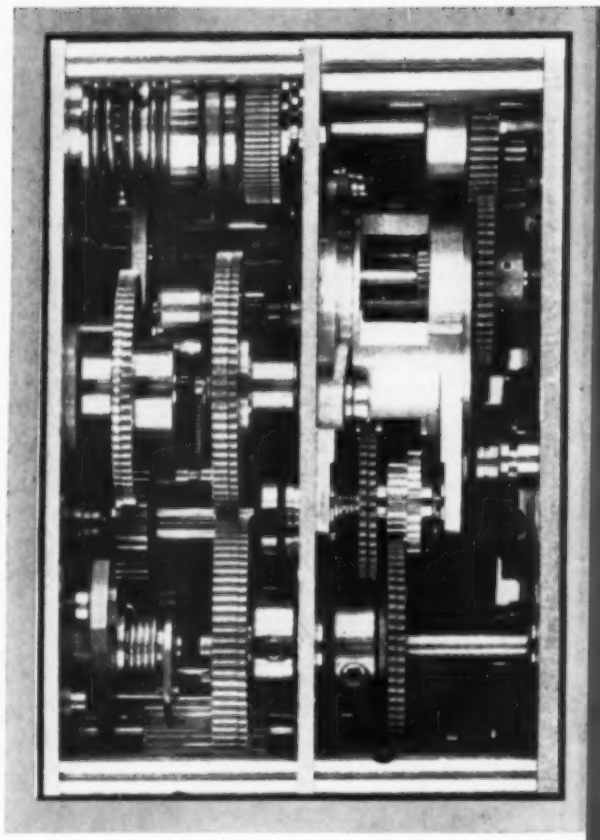
With retail sales burgeoning 34% ahead of last year's pace, there is renewed emphasis on the engineering of new models to fill in gaps in each maker's line. Both Dodge and Ford, for example, have recently announced extra-heavy duty diesel models powered by Cummins engines for highway use. Although Ford is temporarily restricting its diesel to export sales, it will be only a matter of time before volume will force these makers to produce their own diesels.

## ...and away from diesels

GMC, on the other hand, flush with the industry's most complete line of diesel engines, is turning back to gasoline for new product development. Look for July announcement and 1960 availability of two radical new engines—one powerful enough to propel a loaded heavy-duty tractor-trailer combination up steep grades at passenger car speeds, the other a smaller engine of a cylinder configuration never before produced in volume in this country. The big one will be two of the small ones hooked together. These engines are designed to give diesel durability without the initial cost penalty.

## Move to the rear...

Crowded engine compartments and overly heavy front-ends are causing auto engineers to consider moving accessories such as the power-steering pump, air-conditioning compressor and starter to the rear undersides of cars where they could be connected to the propeller shaft or differential.



# NOW YOU CAN *SAFELY REDUCE* SIZE AND WEIGHT OF AIRBORNE INSTRUMENT GEARS

MATRIX 61 GEAR GRINDER

The designer now has the opportunity of reducing both the size and weight of precision instrument gears to be used in aircraft, missiles, etc. In addition, these smaller gears are more accurate, stronger and have much longer service life.

Gears up to 200 diametral pitch are now Crush-Ground directly from solid hardened blanks at production rates comparable to that of cutting unhardened gears.

Because no heat treatment is needed, fire distortion is avoided and AGMA Class 3 Precision is attained.

The Sheffield Crushtrue® Process removes the danger of tooth surface burns because the sharp cutting grains of the crush-formed wheel cut freely without generating excessive heat.

This broadened design latitude is provided by the Matrix 61 Gear Grinder—the ultimate in speed, precision and economy.

For full details, write to The Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. I.

8217

*the* **SHEFFIELD** *corporation*

**manufacture and measurement for mankind** **of Bendix Aviation**

# AIRCRAFT and MISSILES...



## Aluminum armor plate...

Army Ordnance showed off a new series of mobile equipment at its Aberdeen, Md, proving grounds recently. All three pieces of equipment had one science-fiction-like attribute—armor plate made of aluminum.

**The three items displayed were all amphibious,** all capable of being airborne and air-dropped: a self-propelled 105-mm howitzer artillery gun, a new 2½-ton multi-purpose truck supplied by Chrysler Corp, and a 16-man troop carrier built by Food Machinery & Chemical Corp.

**Aluminum applications in the military** are not new, of course. But industry and Ordnance Corps officials are trying to push development of new ground corps equipment that—while not as glamorous as aircraft, missiles and rockets—will speed the striking power, range, and mobility of the Army's foot soldiers. Most ground troops are now being shaped into "Pentomic" or self-contained, self-sufficient, fast-moving striking units.

**The new aluminum armor plate** is being promoted by Reynolds Metals Co, which says it has developed a new heat-treating process to make it easier to weld and extrude.

**The armor** is made from a standard aluminum alloy, 5083. (Over 90% aluminum, 4-5% magnesium, with fractional blends of iron, silicon, chrome, manganese, titanium, copper and zinc.)

**Its main advantage is its lightness.** A plate of aluminum armor can be twice as thick as steel to give the same ballistic protection, and weigh one-third to one-quarter less, says Reynolds.

**This makes equipment using it** adaptable for airlifting and dropping, and cuts down on aircraft fuel, and gives planes greater range as well.

**The Chrysler truck and self-propelled howitzer** are still in the research and development stage, but the troop carrier is now being ordered by the Army as standard equipment.

## New missile contract in the works...

The Air Force will shortly award a weapon system development contract on WS-138A, the air-launched ballistic missile (ALBM). Thirteen companies or industry teams have submitted proposals on the project, which seems certain to burgeon into a major new hardware program.

**The Pentagon wants an amendment** that would award a second prime contract for a "back-up" project—a relationship similar to the Martin Titan's to the Convair Atlas ICBM.

**The ALBM proposals show** the growing industry trend to team bidding—two or more companies joining up as partners on major development contracts. Among the bidders are GE-Douglas, Thompson Ramo Wooldridge-Bell, and Lockheed-Convair teams. Single bids have been made by Raytheon, Northrop, Boeing, Martin, Republic, Fairchild, North American, Temco, RCA, and McDonnell.

**Martin, McDonnell** and the Lockheed-Convair team were contractors on the Air Force's Project Bold Orion—a series of experiments to demonstrate the feasibility of the ALBM concept.

## Incentives for subcontracting?

Bill that would encourage prime contractors to farm out more work to subcontractors is now in the Congressional hopper.

**The Bill, HR 6383,** introduced by Rep McCulloch, is based on the principle that if a prime can save the government money by subcontracting out a job at a low price, the prime shouldn't be penalized by lower profit allowances when the contract comes up for renegotiation.

**It's the old argument against renegotiation** policy which, according to Gordon W Jenkins, spokesman for Strategic Industries Association, "discourages risk-taking (on the part of the prime) and almost forces companies to seek free facilities from government, and to ask for contracts that guarantee reimbursement of all costs."

**Testifying before the House** Ways & Means Committee late in April, Jenkins said that SIA and other subcontractor groups would like to see the end of renegotiation altogether, but failing that they'll settle for the McCulloch Bill amendments.

## Revamp Renegotiation?

Going along with the subcontractors and small business in their active dislike for the present Renegotiation Act (which may be extended) is the Aircraft Industries Association, voice of the nation's prime aircraft contractors.

**Also testifying** before the House Ways & Means Committee, Boeing President William M Allen said, "The Renegotiation Board by its method of administering the Act has taken unto itself the responsibility for determining how strong the defense industry should be."

**In essence, Allen told the Committee** that the Renegotiation Act is today keeping the Defense Department from cutting costs by penalizing rather than encouraging the aircraft industry for getting the most for its money.

**Said Allen,** "We must remember that our real competitors are the Soviets and their satellites, and they have taken great pains to insure that nothing impedes their scientific and weapons production programs."

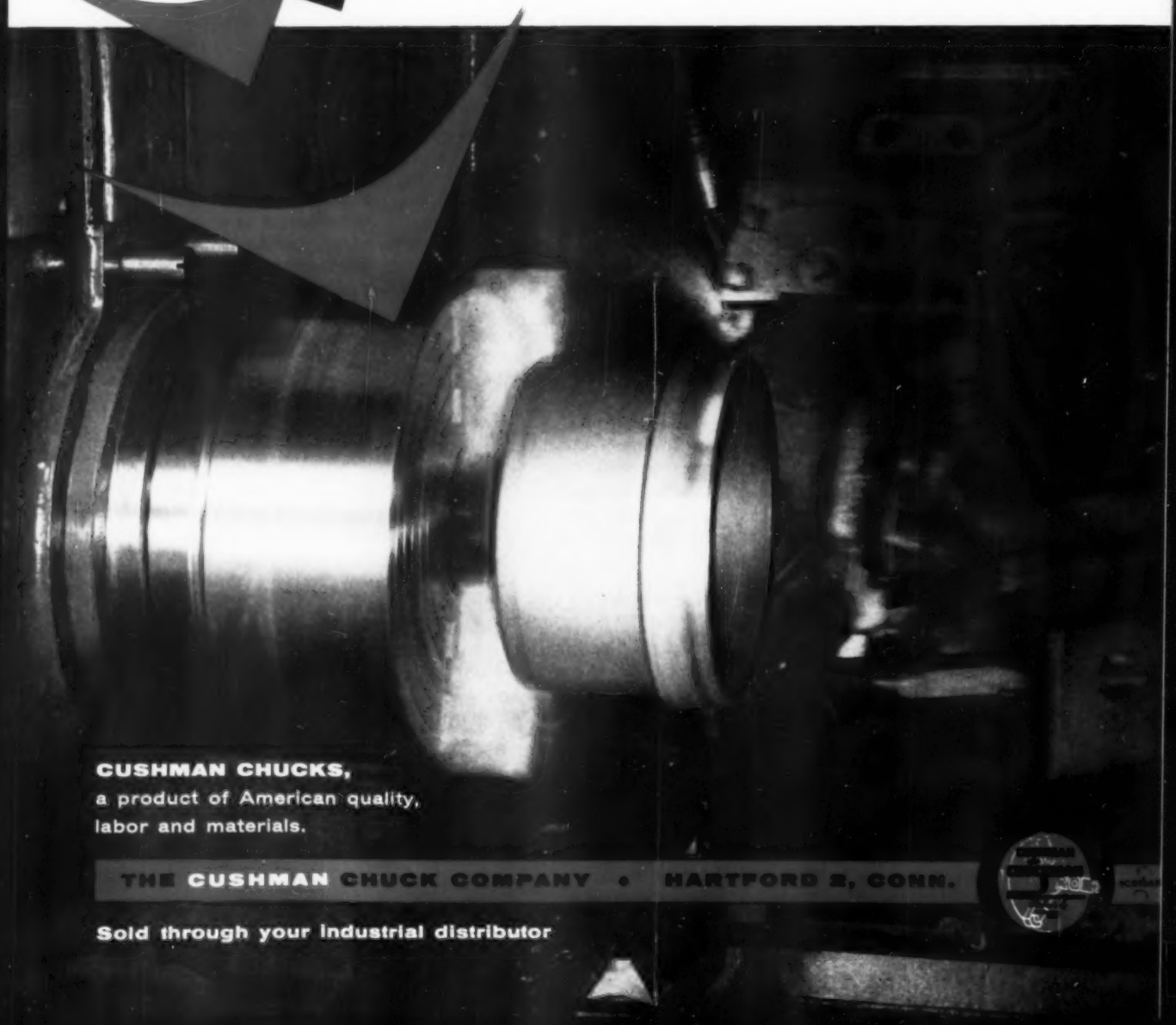
**CHUCKING METHODS CAN BECOME OBSOLETE TOO!**

retool with *Cushman*

## AIR OPERATED CHUCKS

Designed and built to fully meet modern machining techniques and machine tool requirements, Cushman Chucks permit the use of higher speeds with heavier feeds, maintaining closer tolerances with continued repetitive accuracy and result in maximum workholding efficiency with the greatest savings in time and costs.

For profitable machining through the use of precision chucking equipment, specify Cushman Air Operated Chucks.



**CUSHMAN CHUCKS,**
a product of American quality, labor and materials.

THE CUSHMAN CHUCK COMPANY • HARTFORD 2, CONN.

**Sold through your industrial distributor**

# MACHINE TOOLS...

## Recovery: slow but steady...

Few if any machine tool builders are tossing their hats in the air over the state of their business. Yet a slow but steady recovery in net new orders is detected on all sides.

**The situation at Detroit,** for instance, is by no means static. Though most buying for small car programs is wrapped up, several builders expect more orders as the result of forthcoming improvements in transmission and axle designs and the use of aluminum engines. For one thing, at least a fair amount of rebuilding work will continue.

**One important special machinery builder** reports that his sales have risen to 80 to 90% of the volume in the peak years of 1954 and 1955.

**Considerable hopes are being generated** among builders by the upcoming General Motors aluminum engine. Initial orders for machine tools for this job are likely to be modest, with much more to follow after things get going. The whole program is believed to be pointed toward 1961 models to be introduced in the fall of 1960.

**Much of the prospective automobile buying** probably will not be under way until next fall.

## Replacement sales made...

Increased interest by automobile users in purchasing cars with standard transmissions has resulted in some replacement sales of machine tools to automobile companies which had intended to let production of such transmissions come to a halt soon.

**Caterpillar Tractor** as well as other tractor and farm equipment makers have been buying machine tools the past few months. Inquiries from these sources are very good too.

**One prominent auto truck manufacturer** caused quite a stir recently by placing a large order for a battery of high-production machine tools with a British builder.

**Orders for special machine tools for missile work** have been the subject of considerable talk. The machines on order are in the so-called elephant class. Several of them are of pioneering design. Machines for work on instrumentation components for missiles have accounted for some of the new orders recently.

**One well-known machine tool builder** now has what he terms a normal volume of business. He is up to 75% of his all-time peak and production still is rising. Another builder, who got down to about 30 standard machines a month, has a current schedule of 60 for May.

## Expands engineering work...

A midwest builder has enough new business, particularly on specials, that its engineering department is operating 50 hr a week and it is looking for engineers to help keep up with the growing load of work.

**Still another midwest builder** had a big March, the best month in two years, and April was good but not up to the March level. Nevertheless its net new orders lately have been double its shipping rate. The management expresses "cautious optimism" about the remainder of the year.

**Orders for presses have been way up this year** compared with a year ago, but still are far from what they should be. The dearth of demand for big heavy presses is holding down the over-all dollar total.

## Rockford Machine Tool diversifies...

Rockford Machine Tool Co, Rockford, Ill, has purchased the Maplewood Machinery Co, Chicago, maker of roll forming machines. Maplewood operations are being moved to Rockford. This is one more example of a cutting-type machine builder diversifying by acquiring a forming machine to build and sell.

## German lathes to be imported...

Two important deals are pending whereby high-quality West German lathes will be imported and sold in this country. One deal is believed to have been completed or will be by the time this page is in print. The second deal has reached the crucial stage and the final agreement is likely to be signed this month.

## ASF buys South Bend Lathe...

Mergers still are benig carried through and are in the negotiating stage in the machine tool field.

**South Bend Lathe Works, South Bend, Ind,** is being acquired by American Steel Foundries, which has long been represented in the machine tool industry by its King Machine Tool Division and its Elmes Engineering Division at Cincinnati. The financing is being done by an exchange of stock. South Bend stockholders must ratify the agreement.

**A well-known builder of standard machine tools** is likely to be merged with another builder later this year. Negotiations, already under way, probably will not be concluded for several months.

BT.

# Why G-E man-made industrial diamonds are revolutionizing carbide grinding

Metallurgical Products Department reports on users' experience. Results: 35% higher average efficiency . . . at least 20% lower power consumption . . . than is possible with natural diamonds.

Now it has been proved . . . grinding wheels containing General Electric man-made diamonds *actually out-perform natural diamonds!*

In actual production, G-E man-made diamonds have maintained sharper cutting edges, have cut more freely. They top natural bort because rigid manufacturing control maintains uniform quality. G-E man-made diamonds are more blocky and rough surfaced . . . provide extra support in the bond. They are also more friable, so that sharp, new cutting edges are constantly presented in the grinding operation.

Wheels made with General Electric man-made diamonds are available *in quantity* now. They'll deliver a production bonus averaging 35%. Be sure *you* cash in on this superior performance by specifying wheels containing G-E man-made diamonds from your regular wheel supplier. *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Blvd., Detroit 32, Michigan.*

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

# MATERIALS...

## Vacuum-melted steel...

A whole new horizon in steel production is rapidly unfolding under the impetus of vacuum melting and casting techniques. It wasn't until the advent of titanium refinement that metallurgists realized something could be done to eliminate hydrogen embrittlement in steel, and to eliminate oxygen by other than chemical means.

**Vacuum treatment will improve the quality** of all grades of steel; as well as the superalloys and newer metals. However, the technique *must* be used to achieve the full strength requirement of the alloys used in some parts of aircraft and missiles. In the low-alloy steels and bearing steels which are being vacuum melted, for example, improvements of up to 30% in fatigue strength and up to 100% in transverse ductility are being obtained. Furthermore, vacuum melting reduces by 75% or more the quantity of silicon and aluminum which must be added to remove oxygen. Thus, it minimizes the hard oxide inclusions which result from these additives.

**Vacuum-melted steels** are finding acceptance at a rapidly increasing pace. Eventually applications will include all grades used for parts requiring a high strength/weight ratio, including automotive and high-speed machinery components, or special magnetic properties.

**Many of the materials presently being vacuum**-arc melted go into high-stress rotating parts where failure would be dangerous and/or expensive. Stainless steels for the nuclear power field, bearing steels for heavy-duty operations, low-alloy steels for aircraft frames, tool and die steels, iron- and nickel-base magnetic materials and some electrical steels are now being refined in this way.

**Most high-temperature materials,** including the superalloys, have such critical applications that users' specifications for these materials have already been revised upwards, making vacuum-arc melting mandatory. Even the best air-melted heats can be improved by vacuum-arc melting. Improvement consists of a reduction of non-metallic inclusions, essential elimination of segregation of alloying elements, and gains in most physical and chemical properties.

## Equipment for production...

Most steel producers are studying vacuum techniques. (An Aircraft Industries Assn survey shows a need for 1000 tons/mo by 1965 for aircraft and missiles alone.) Recently, two companies, Latrobe Steel Co and Vanadium Alloys Steel Co, both in Latrobe, Penna, announced that they were in production with vacuum-arc furnaces. Each company has installed one furnace, in its own special building, and Latrobe is planning to add more furnaces. Each of the furnaces presently in production can produce ingots up to 8500 lbs. Claims are that each furnace can supply from 3000 to 4000 tons of steel per year.

**Latrobe Steel Co's furnace was designed** and built by the Lectromelt Furnace Div of McGraw-Edison Co. In the consumable-electrode vacuum-melting process (vacuum-arc), an air melted electrode of the desired alloy is suspended in the water-cooled copper crucible of the furnace. Vacuum pumps are turned on. A low-voltage, low-amperage arc is struck; amperage is increased and the electrode melts. Inclusions such as oxides are removed by reaction in the arc and dissolved gases in the steel are drawn off under vacuum. As the molten alloy continuously solidifies from bottom to top, and from the outside in toward the center, in the crucible, other undesirable non-metallic inclusions float to the top and segregation of constituents from face to center is minimized.

## Unique power supply...

**The Lectromelt furnace at Latrobe Steel** has a 20-in.-dia crucible. Its power supply, said to be the first of its kind in the world, requires only 50% of the floor space normally used by conventional systems delivering equal power. It is a 17,500-amp silicon-diode rectifier which is saturable-reactor controlled and sealed in a water-cooled housing. An electrode drive control automatically corrects all variables within 1/100 sec during the melting cycle. A mechanical-booster vacuum system can exhaust 4500 cu ft/min, with a blank-off pressure under 5 microns.

**Furnace down-time betwen melts is about 20** min. and three men can easily handle two furnaces. The furnace was designed to use a larger diameter electrode, thus minimize the towering height normally seen. It stands 14½ ft above the floor; extends the same distance into a pit.

**Housed in a building of its own at Vanadium** Alloys Steel Co is a 45-ft-high consumable-electrode vacuum melting furnace built by Consolidated Electrodynamics Corp, Rochester, NY. It can produce ingots from 9 to 24 in. in dia weighing from 500 to 8500 lbs. The arc is automatically controlled by a German electronic system. Normal operating vacuum is under 5 microns but the vacuum potential is 0.3 microns and this can be achieved in six minutes. The furnace can produce square and rectangular ingots as well as the conventional round shape.

OK . . . for precision grinding
at high production speeds

SIMONDS ABRASIVE CO.

# CRANKSHAFT GRINDING WHEELS

ON THE JOB AT CATERPILLAR
Simonds Wheel used on crankshaft grinding at Caterpillar Tractor Co. Plant, Peoria, Ill.

Fast and free-cutting these wheels hold up well on the corners, maintain radii and need only the minimum of dressing. Also supplied in matched, counter-balanced sets for multiple spindle set-ups . . . with each wheel marked with set number and with red stripe for accurate line-up on the spindle. Typical specifications for main or line bearings, JA543-05-V1 (multiple set-up) . . . for pin bearings, JA543-Q5-V1 (single wheel set-up). Write for Bulletin ESA 263.

CALL YOUR SIMONDS DISTRIBUTOR
P roven products
D ependable know-how
Q uick supply

SIMONDS ABRASIVE COMPANY
Tacony & Fraley Sts., • Philadelphia 37, Pa.
*Division of Simonds Saw and Steel Co.*

BRANCHES: CHICAGO • DETROIT • LOS ANGELES • PHILADELPHIA • PORTLAND, ORE. • SAN FRANCISCO • SHREVEPORT

# WHAT'S AHEAD... in Metalworking

TRENDS

## Basic metalworking faces profits squeeze...

Business generally is picking up in volume in the basic metalworking industries. But there's a catch—in many such industries profit margins are shrinking as orders and output rise.

**Take, for example, general metalworking job** shops. Orders are now coming in faster than they have in years, possibly because of the steel strike threat, but more likely because of a general all-around healthy upturn in the metalworking industry.

**But the job shops are operating** on a "mighty tight margin" because there still isn't enough business for everyone and recession-created price cutting persists despite the upturn. This situation, it is hoped, will end within a month or two if sales continue to improve.

**Much the same situation exists** among the manufacturers of fractional-horsepower and miniature motors, who are making an uphill fight to absorb increasing material and labor costs and still hold prices at acceptable levels.

**Some motor producers** expect to have to increase their prices 5% by year's end, but others maintain they will hold steady or even drop slightly. Only obvious solution: cheaper and more efficient manufacturing methods.

**But the small motor business,** profits squeeze or no, is headed for boom production levels. Expectations are that 1959 will at least equal 1957, a record year for much of the industry.

**Low prices and high production costs** are having their effect on the metal-stamping industry, too. Business is picking up at a modest rate, is now about back to 1957's fairly strong levels, but industry officials say prices are "definitely squeezing tighter, and there's just not enough business around to make it possible for us to do anything about it."

**Stamping industries** are now pretty well balanced, with the exception of steel. The outlook: business will continue to pick up but there's little possibility of 1959 breaking any records.

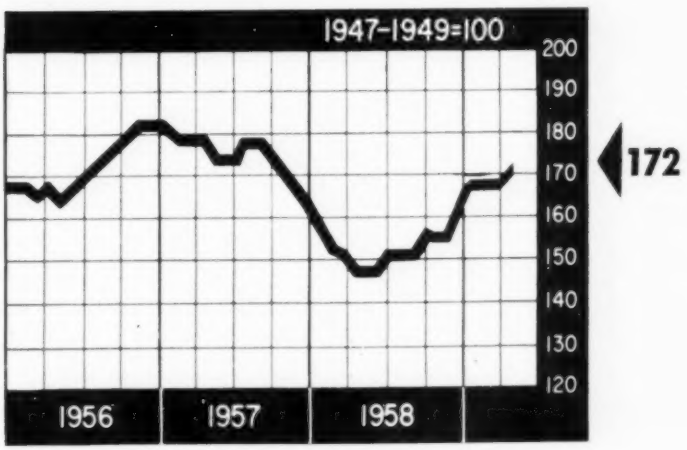
**Close profit margins are being recorded** in the foundry industry also. Nonferrous foundries, for example, report that orders are just beginning to pick up (business has been running just about at last year's levels) but buyers are extremely cost conscious and as one foundryman puts it, "Making money in this business is getting harder all the time."

**Nonferrous foundries** still have little or no backlog, are holding inventories down because most customers are still buying hand to mouth.

**Brightest spot in the basic metalworking picture** is heat treating. Job shops are now operating at near-record levels, something like 50% ahead of comparable 1958. The boom is expected to continue, mainly because many firms are spending less on new equipment, more on maintenance.

**Steel warehouses today** paradoxically, in view of the steel strike threat, have more steel on hand than they have at any time since 1956. The warehouses have about 3.7-million tons on hand, but it's mainly because there's no shortage of plate and structurals, as there was in 1956.

**Current inventories at the steel warehouse level** would last about 5½ months, but a strike could cause shortages within weeks. Demand, sparked by booms in the appliance and farm equipment industries, is very high in the Midwest.




**AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION**

**BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS**

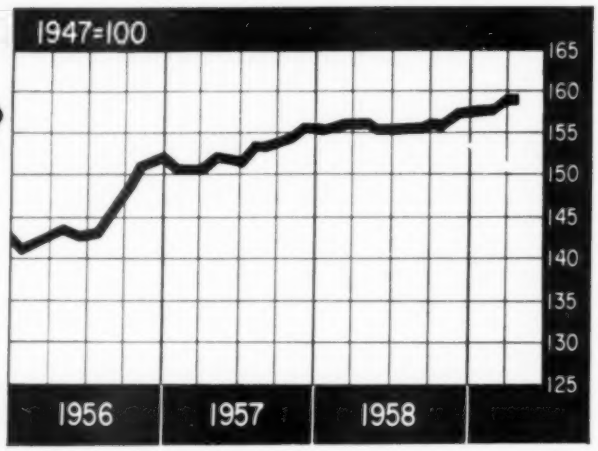
| | APR Estimated | MAR Preliminary | FEB Revised | MAR Year Ago |
|---|---|---|---|---|
| **Total Index** | **172** | **170** | **168** | **150** |
| Machinery | 141 | 138 | 127 | |
| Electrical Machinery | 192 | 199 | 170 | |
| Autos | 131 | 129 | 94 | |
| Other Transportation | 340 | 335 | 333 | |
| Other Metalworking | 147 | 144 | 130 | |

# TRENDS

# WHAT'S AHEAD... in Business

**AMERICAN MACHINIST INDEX OF METALWORKING PRICES**

| | APR Estimated | MAR Preliminary | FEB Revised | MAR Year Ago |
|---|---|---|---|---|
| **Total Index** | **158.7** | **158.5** | **158.4** | **156.0** |
| **Metalworking Machinery** | **183.7** | **182.6** | **182.3** | |
| **Other Machinery exc. Electrical** | **170.1** | **169.9** | **166.0** | |
| **Electrical Machinery** | **158.9** | **158.6** | **157.5** | |
| **Fabricated Metal Products** | **148.7** | **148.7** | **146.6** | |




## Incomes climb as output grows...

Gross national product is now riding at an annual rate of $470 billion—an all-time record, and up from $453 billion since the end of last year. Rising industrial output has been pacing the rapid growth of GNP in recent months. The index of industrial production has reached a record of 149, up from a year-end level of 142.

**Scare buying of steel** is certainly not the only force behind the increased industrial activity, though it has been an important factor. The increase in capital spending has played an important role. So has the greatly increased output of consumer durable goods.

**Total output of consumer goods** is two-fifths above last year's depressed level. And the output of automobiles alone is at least 50% higher than at this time last year. So continued high levels of business depend a lot on what consumers and businessmen do with their rising incomes.

**And their incomes have been rising.** Total personal income is already at an annual rate greater than $370 billion—more than $20 billion above a year ago—and is still growing.

**Rising employment registered in recent weeks** is a pretty good indication that personal incomes will continue to rise also. And the planned 3% increase in jobs for 1959 reported by the McGraw-Hill survey should result in an unemployment level for the remainder of this year far below last year's level.

**The consumer's improved financial condition** is beginning to show up as increased spending on big-ticket durable goods. For the first time this year installment credit has registered an increase. Borrowing for new car purchases will add to this trend as we move into the summer.

**Business incomes, too, are on the rise.** First quarter pre-tax profits were close to a rate of $49 billion, about 10% above the fourth quarter, and a whopping 55% above the first quarter of 1958.

### WEEKLY BUSINESS INDICATORS

| | Latest Week | Preceding Week | Year Ago |
|---|---|---|---|
| *Business Week* Index of Activity (1947-49=100)* | 149.2 | 149.8 | 121.2 |
| Steel ingot production (thousand tons) | 2,668 | 2,627 | 1,334 |
| Electric power output (million Kilowatt hours) | 12,546 | 12,538 | 11,251 |
| Production of automobiles and trucks | 155,210 | 171,280 | 105,776 |
| Engineering construction awards (Eng. News-Record, millions) | $403.6 | $410.9 | $380.6 |

### MONTHLY BUSINESS INDICATORS

| | Latest Month | Preceding Month | Year Ago |
|---|---|---|---|
| Refrigerators sales (thousands of units) | 306 | 256 | 228 |
| Vacuum cleaners sales (thousands of units) | 271 | 243 | 226 |
| Washers sales (thousands of units) | 298 | 288 | 263 |
| Household electric ranges sales (thousands of units) | 86 | 79 | 75 |
| Radio production (thousands of units) | 1,125 | 1,125 | 877 |
| Television production (thousands of units) | 459 | 437 | 370 |
| Gear sales index (1947-49=100) | 199.9 | 218.6 | 179.1 |
| Foundry equipment new orders index (shipments, 1947-49=100) | 237.1 | 127.4 | 57.6 |

* Seasonally adjusted

# SPARE PARTS ARE RARE BIRDS

**because...**

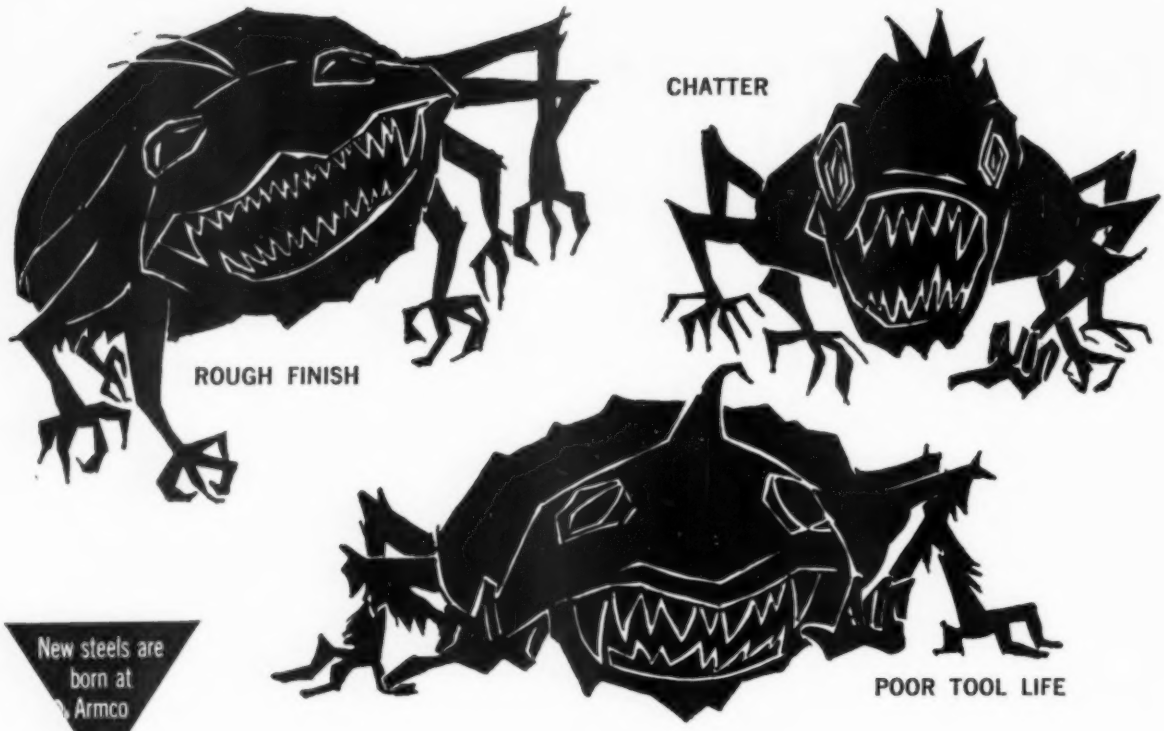
**WILLIAMS SUPERJUSTABLES LAST and LAST and LAST**

Superjustable® Wrenches are available in Regular or Locking styles with chrome or black finish. Made in 4, 6, 8, 10, 12, 15, 18 and 24 inch sizes.

FOR PROMPT PERSONAL SERVICE — CALL YOUR LOCAL DISTRIBUTOR

WILLIAMS
DROP FORGED
TOOLS OF INDUSTRY

**J. H. WILLIAMS & CO.**
DIVISION OF UNITED-GREENFIELD CORPORATION
408 VULCAN ST., BUFFALO 7, N.Y.




New steels are born at Armco

# MACHINING "BUGS" CHEWING UP YOUR PROFITS ON STAINLESS JOBS?

## Get rid of them with Armco FM Stainless and Armco Services!

If machining "bugs"—chatter, rough finish, torn threads, off-size holes, poor tool life—are chewing into your profits on stainless jobs, Armco Free-Machining Stainless Steels and Armco Machining Service can help you.

Armco produces *11* different grades of stainless with machining properties superior to their standard counterparts. For practically all stainless jobs, you'll find an Armco grade that can insure faster cutting rates or better finish.

Armco also has published a complete library of manuals and reprints of articles by shop-trained machining experts. These free publications not only give you the basic information on feeds, speeds, and cutting tools for various operations but provide described practical solutions to typical machining problems. To help train your operators, Armco also has a motion picture, "Machining Stainless Steels," that's available for showing at no cost to you.

Try these free-machining Armco Stainless Steels in your shop and see for yourself how they can improve your profits. Just call your Armco Stainless Steel Distributor, or fill out and mail the coupon for information on grades, sizes and delivery.

**ARMCO STEEL CORPORATION, 1929 Curtis Street, Middletown, Ohio**

Send me information on

- ☐ Armco FM Stainless Steel Bars and Wire
- ☐ Machining Stainless Steel, particularly on_____
- ☐ How to borrow your movie "Machining Stainless Steels"

Name_____

Company_____

Street_____

City_____ Zone____ State_____

# ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

# What Every Company Should Be

Have you noticed how the steel industry and the United Steel Workers have been arguing their case in public in paid advertisements while secretly meeting in daily sessions? Both sides recognize the power of public opinion and the inestimable value of having "the people" sympathetic to them.

## This spectacle is...

a fascinating example on a national scale of what every metalworking company should be doing in its own community to keep neighbors and the local citizenry informed of its activities. Yet what do we find? Not very much to be proud of, is the answer.

"If we handled our manufacturing, engineering and sales in the same half-hearted, completely slip-shod, lip-service manner in which we handle our simplest relations with our plant communities," Alphons John of the Kearney & Trecker Corporation pointed out recently, "all of us would have been out of business 20 years ago."

## It unfortunately is true...

that some manufacturers like to keep their day-to-day happenings and their future plans to themselves. They "clam up" and seem to feel better if they can prevent everyone, including employees and townspeople, from knowing what they are doing. They regard their operations as private goings-on that are nobody's business. Happily, the number of companies with this nineteenth-century attitude is dwindling.

The fact is that sheer negligence is responsible for the absence of a consistent, working policy of community relations in most companies. There is no wilful withholding of information from employees, neighbors and townspeople in general. If a company does not participate as it should in community activities of various kinds, it usually is because the management is too much absorbed in pursuing its job of designing, making and selling its products.

Such absorption is short-sighted. This is a day when business is conducted pretty much in a glass bowl for everyone to look on and see what management is doing. Stockholders, employees, neighbors, the entire community are more than interested spectators, because their incomes, their jobs, tax revenues and the well-being of the city itself are at stake.

## So community relations...

defined in a broad sense, should not be handled in a left-handed sort of way. It should be supervised, and at least partially administered, by top management itself. There is no substitute for the benefits to be derived by the company and by the community itself from the top man's active participation in important community enterprises.

No finer tribute can be paid to a company than to have the people in its community view it as a good citizen. To attain that distinction is worth a lot of effort. And when the company has established itself in that enviable position, the chances are that it will do a better job for everybody—stockholders, employees and the nation.

Burnham Finney EDITOR

# ON PARTS LIKE THESE---

## keep your costs DOWN with the NEW model B

# CLEVELAND

On jobs that require turning and forming multiple diameters, shoulders and tapers, you can count on your Model B Cleveland Single Spindle Automatics to give you lowest machining costs. One end working tool can be mounted on the milling slide and, by adding hopper magazine, second operation work, such as threading other ends of studs, can be performed. In many cases, parts which otherwise would require multi-machine processing can be *made complete* on the highly versatile Cleveland.

The NEW Model B's are *faster*, too . . . with many design improvements and new features that give you new performance potential. They are fast-cycling, quick and easy to set up, fully automatic . . . ideally suited for both short and long run jobs.

*Write for new bulletin, or call in the Cleveland Sales Engineer in your area.*

New Model B Clevelands are built in 1⅝" and 2½" capacities; also available to handle 18" work lengths.

**Use YOUR New Model B**

for fast, economical production of

**armature shafts • arbors • pins • studs • transmission shafts • nipples • axles**

and countless other similar parts — whether you need 50 pieces (sometimes even fewer), or thousands.

**Here are some of the new features of this versatile and practical single spindle automatic:**

Increased Spindle Speeds (up to 2017 on the 1⅝" machine) • Separate Feed Motor • Independent Front and Rear Cross Slides • Quick-set Stock Feed • Quick Change Collet and Feedshell Pads • Gusher Coolant Pump • Automatic Lubrication

**EXTRA** Accessories Include Cross Slide Turning Attachment, Hopper Magazine, Independent Cut-off Attachment, Automatic Bar Loader.

**Remember, CLEVELANDS CUT COSTS!**

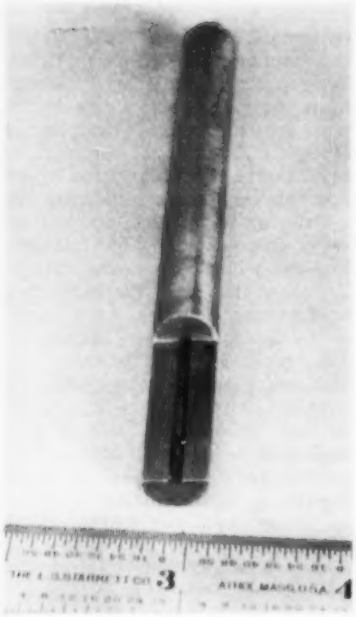
## THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO • CLEVELAND • DETROIT • HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

**Hot drilling** . . . is set up on 10-in. lathe with motorized tool in tailstock and work inserted through heater on compound slide



**Fuel rod** . . . has clean drilled hole produced at high temperature. Rod OD is Zircalloy clad to prevent oxidation

# HEAT *makes it easy to...*

# *Drill Small, Deep Holes in Uranium*

By Edward J Lach, general foreman and Randall Lenz, engineer,
Central Shops Department,
Argonne National Laboratory, Chicago

Hot machining solves the work-hardening problems when small holes are drilled deep into uranium rods. Best cutting conditions and most reasonable tool life result when the work is held at a temperature close to the annealing and recrystallization point. Experience with uranium fuel rods drilled to admit thermocouple wires shows that this difficult-to-machine metal can be tamed—under the right conditions.

Uranium usually workhardens rapidly, and machining is often a race to keep the cutting-tool tip ahead of the workhardening area. Although we learned some time ago that most uranium machining jobs can be handled without too much trouble ("How to Machine Uranium" by Denst & Ross, *AM*—Aug 1 '55, p95), small-hole drilling is still a time-consuming, tool-busting job.

At first we made no progress at all; the HHS drills wore rapidly, they could not long withstand the axial thrust required, and a high feed/speed ratio was required.

But heat made all the difference for drilling 5/64- and 3 32-in. holes axially through the 7-in. rods. The work is now chucked in a lathe collect and inserted through a 5-in. 100-watt ceramic resistance heater held by a Transite fixture on the lathe compound. The heater is clearance bored for the work OD—$\frac{3}{8}$ in. The tool is driven by a tailstock-mounted motor-driven geared spindle at 150 rpm, which combines with lathe-spindle speed of 640 rpm to produce a total 790 rpm.

A Variac automatic control maintains the work temperature at 932 F ±122, at which the uranium acts as soft as lead, and the drill will cut 4-5 in. of hole depth before sharpening is required. This heat would normally anneal the drill, so cutting is done in pulses, taking 0.005-0.010 in. per cycle. Drills are HSS with 118° points and webs thinned to reduce point pressure and to insure accurate centering.

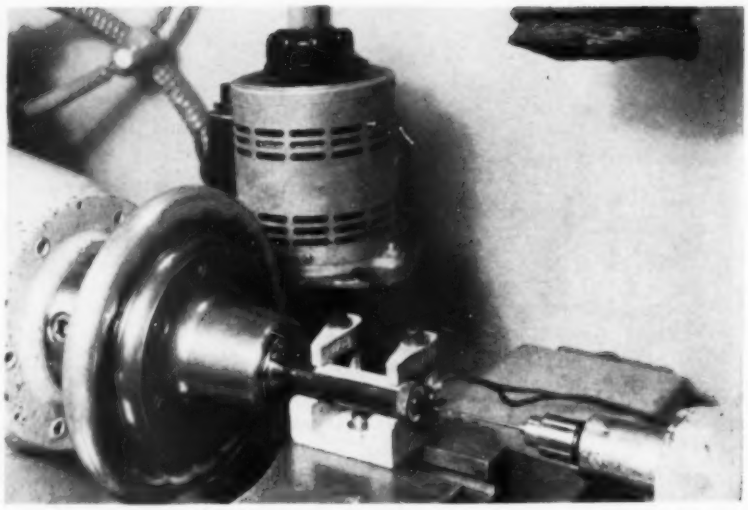
Each rod is drilled more than half way through, then reversed for a second cut. Uranium is normally

Argonne National Laboratory is operated by the University of Chicago for the U S Atomic Energy Commission.

abrasive to cutting tools, in spite of its low hardness—15-20 $R_c$; but heat increases tool life. The only difficulty is when a cut is halted and the work must be reheated, which allows workhardening. This effect occurs sometimes when the second cut breaks into the first, but a skilled operator can keep tool damage low.

Uranium is chemically active and will oxidize rapidly when heated in air—for which reason the rods are Zircalloy clad. But this property is an advantage with pulse drilling because the hot chips decompose into a fine powder to clear the tool.

Cladding cannot be applied to all uranium parts, but hot machining in inert atmospheres such as argon and helium shows promise. Some success has been attained by applying these hot-machining principles to other hard-to-machine metals, such as tungsten.



**Ceramic heater . . .** is bored to clear ⅜-in. work. Drill cuts up to 4 in. deep, then work is reversed

# Grinding the "classified" out of old military specs

Convair's Plant 1 at San Diego isn't in the garbage disposal business. Even so it operates a "garbage grinder" large enough to process all the garbage collected from a city of 25,000 people. But instead of processing garbage Convair's machine destroys evidence, or as the industry calls it "hot paper.'

The business of designing and building aircraft produces tons of waste paper a year as a sideline—in the form of technical bulletins, orders and blue-prints. When the end product is military, much of this waste paper is classified material, and federal government regulations require that it be completely destroyed.

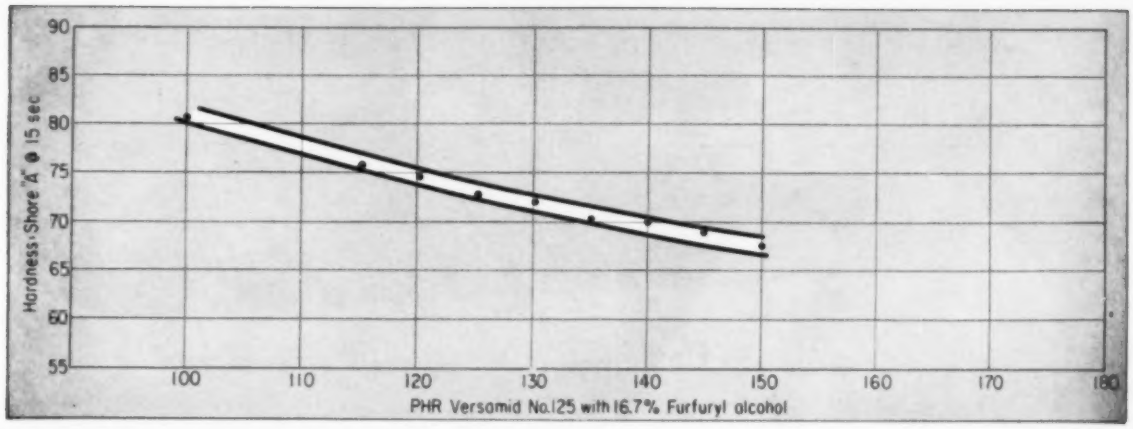
Up to three years ago, Convair burned all its waste paper in an off-site incinerator. All paper had to be stored under lock and key, then on burning days the paper was "escorted" by Convair's Plant Protection Dept to the incinerator and burning of every scrap was carefully supervised—a tedious job.

But now Convair has a machine that digests its "hot paper" into a mass of pulp. Security measures are still enforced right in the machine room, but the machine ejects pulp that needs no more chaperoning than that supplied by the fork-lift truck operator who removes the filled bins.

The machine that does the job is an offshoot of the paper industry, developed to its present degree by Convair engineers. It can reduce any kind of paper to pulp, is so efficient that its pulp product is as innocent of printing as a new log in a pulp mill.

Not only that, by products of the machine do not pollute the air as did those of the incinerator— an important consideration these days in California.

The converted garbage grinder, made by Wandel Machinery Co, Pomeroy, Pa is one of several recent Convair capital investments designed to help the company's air purification program. Others: non-smoke-producing boilers, and water-scrubbing units for chemical setups and paint spray booth exhausts.




**Hardness varies with mixture . . .** Here, 100 parts of Epon 815 resin were mixed with varying amounts of Versamid No. 125 containing 16.7% furfuryl alcohol. Samples were cured at room temperature for 3 days

# Dies get flexible facings with low-cost epoxy

By James Bock, equipment & process engineer,
Grumman Aircraft Engineering Corporation, Bethpage, NY

**A new formulation of Versamid-based epoxies, modified with furfuryl alcohol, reduces the cost of capping drop-hammer dies and produces flexible facings at least as good as those made of other materials.**

The Versamid-epoxy systems show greater resistance to aging than other epoxy flexicisers. In addition, they simplify shop procedures, because they also act as curing agents for epoxies.

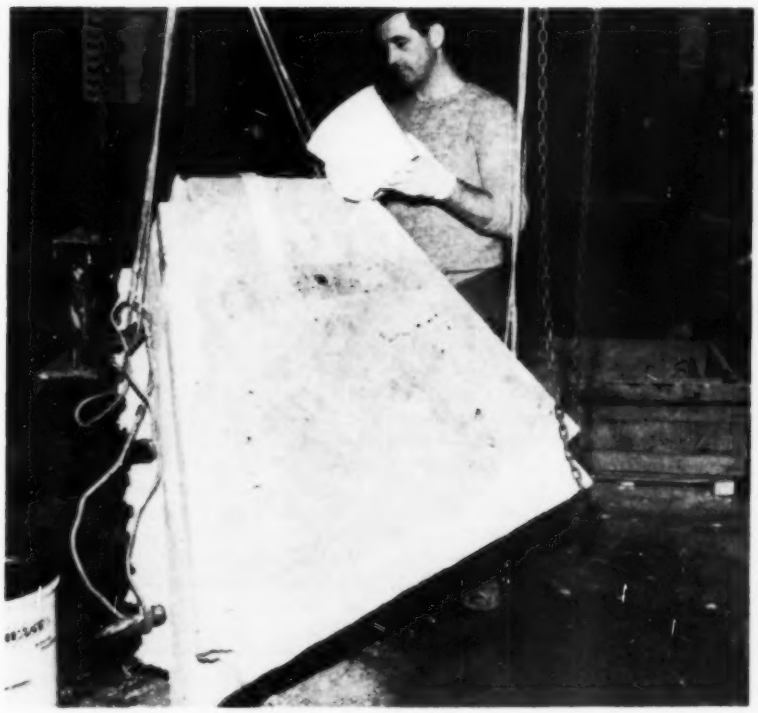
Castable formulations of the material can be produced to cover a wide range of hardnesses—from 5 to 100 on the Shore "A" Durometer scale. A hardness of 70 is desirable for drop-hammer punch faces.

A major difficulty in developing these formulations was caused by the extreme viscosity of the Versamids. However, when Versamid No. 125 is diluted with 16.7% of furfuryl alcohol, blending is relatively easy and bubble-free casts can be made. The alcohol does not injure the physical properties of the cured system.

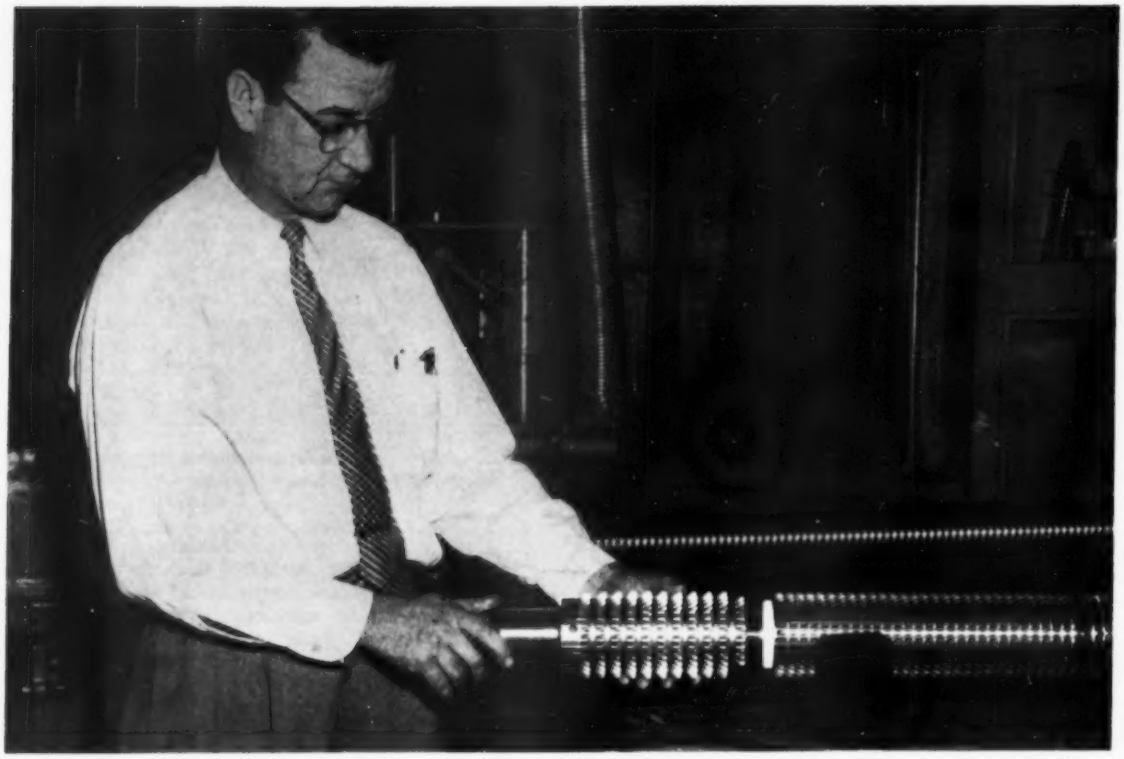
The Versamid-epoxy blends should always be thoroughly mixed by some mechanical means such as a "Jiffy Mixer" in a ½-in., 500-rpm drill. After about 10 min of mixing, the batch should stand for about 15 min to allow all air to escape.

A blue colorant in the resin helps determine when mixing is complete. As long as the batch shows any any streaking or other color deviations, the mixing must continue.

Once mixed, the material must be cast immediately. It has a pot life of slightly less than one hour at room temperature. It will cure within several hours and will develop maximum physical properties within a few days. A Versamid-epoxy punchface can be put into service in 2 to 4 days after pouring.



**Resin is poured into cavity . . .** between drop-hammer die halves. After overnight curing, the resilient material provides a flexible face for die set



**Short shell combines operations . . .** when precision internal gears are broached. Highly accurate full tooth form is easily ground on the shell, which is being added to a full-size roughing broach

# Full-Form Finishing . . .

**. . . . is a new broaching development for precision internal gears. It combines roughing and finishing in one pass to improve accuracy, increase tool life, and simplify production. This method is applied to machine better internal spur and helical gears in about half the usual time.**

Internal gears have been broached for some time, but two setups have been required; one for roughing, one for finishing. Broaches as long as 6 ft and as heavy as 700 lb have been set up to cut gears to close tolerances. But this new development allows broaching gear blanks complete in a single pass of a special pull-up tool.

The trick is in tool design. A shell section about 10 in. long contains the finishing teeth. It is added to the main broach body, on which the usual roughing teeth have been ground.

The idea is a joint development of Warner Gear Div., Borg Warner Corp. (where the work is being done) and National Broach and Machine Co. (who supply the tools).

Finishing teeth on the shells can be ground to closer tolerances than is possible with long conventional broaches. Tooth spacing is extremely accurate because the shells are made on a precision indexing setup. And the involute profile on a gear can be easily controlled by changing the face angle on the tooth form in the shell.

### Shell floats for alignment

Ordinary roughing broaches are modified by grinding a seat that will fit the shell bore. The shell slides onto this section and is held by a nut that also acts as a rear pilot. Beyond this point the operation is conventional.

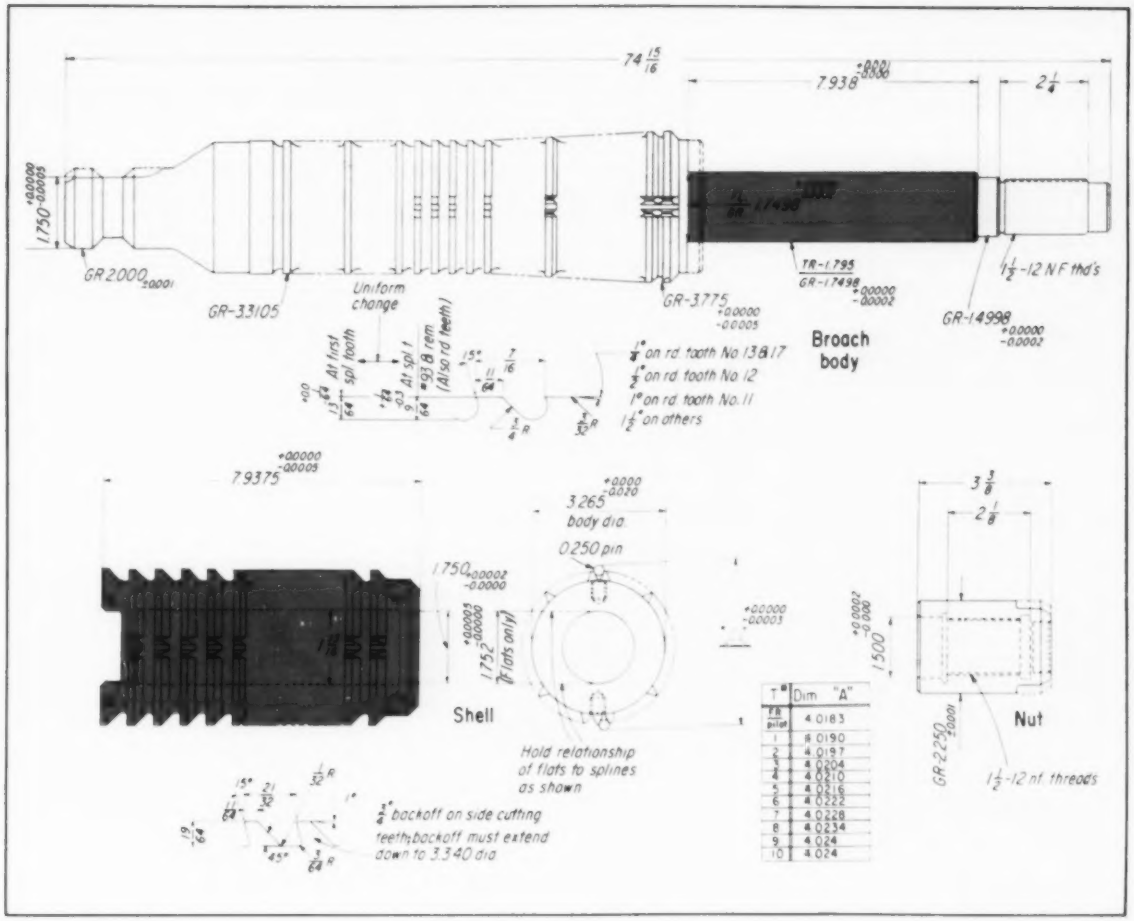
Alignment accuracy between the roughing and finishing teeth is maintained by about 0.0008 in. assembly clearance. This floating movement makes the shell align itself as it is pulled through the gear. Radial splines on the shell act as front pilots as they precede the finishing teeth through the work.

### Helical gears at 125/hr

A shell-and-roughing-broach combination that cuts 42 teeth in internal helical gears is typical of the new tools. The shell has 12 rows of finishing teeth, each of which removes about 0.00025 in. of stock from a side over the full tooth form—not including the OD, which is produced by the roughing tool. This particular tooth form is a modified involute—with −0.0007 in. above a true involute curve on the coast-down side of the tooth, and 0 to +0.0003 in. involute on the drive side.

Two of these tools are installed in a 30-ton vertical American broaching machine to produce approximately 125 gears/hr. Increased tool life is one of the advantages of the new design; and in this case the shell outlasts the roughing broach 1½:1.

Shells for a 35-tooth spur gear outlast the roughing broach by approximately 3:1. Some 1500 of these gears are broached between grinds, and total shell-life time runs about 150,000 pc.


Broach body
Shell
Nut
Hold relationship of flats to splines as shown
Uniform change
At first spl tooth
At spl 1
93 B rem (Also rd teeth)
1° on rd tooth No 13 B 17
½° on rd tooth No 12
1° on rd tooth No 11
1½° on others
¾° backoff on side cutting teeth; backoff must extend down to 3.340 dia
body dia
0250 pin
1½-12 NF thd's
1½-12 nf threads
Dim "A"

**Shell fits on tail section . . .**
of conventional roughing broach. Tool assembly cuts teeth in three spur-gear blanks at a time in a pot fixture. Roughing broach is over 6 ft long; shell is almost 8 in. long

**Helical gears at 125/hr . . .**
are broached in double setup. Tools are rotated as they are pulled by a spiral lead bar. Speed is 12¾ ipm. Cutting oil is chlorine base. Surface finishes run 20-40 mu in. on 8620 and 4027 electric-furnace steel forgings

**Typical internal gears . . .**
are shown with the shells that finish them. Two pump gears and two helical overdrive gears illustrate good finishes that have no generating marks caused by nibbling action

# Wage-price spiral perils U.S. in world

**The United States will lose its place as the world's leading manufacturing country unless the wage-price spiral is reversed, Ralph J Kraut, president, National Machine Tool Builders' Association and president, Giddings & Lewis Machine Tool Co, told members at the 57th spring meeting of the NMTBA at the Statler Hilton Hotel in Detroit April 30-May 1. Wages here are so high that their effect on production costs cannot be overcome by the traditional means of greater productivity. German workers are paid in marks the same rate that U S companies pay their men in dollars. Moreover, Germans work harder and their basic workweek is longer.**

### Germany's "Economic Miracle"

Mr Kraut pointed to the rapid gains made abroad in technology and emphasized that the economic miracle in Germany is real. He also mentioned the British recovery which has been slower but perhaps even more solid than the German. He said that there are 1500 machine tool builders in western Europe competing against American builders. In 1957, a good year, the German and British machine tool industries combined outproduced the U S industry in physical volume. Last year each of them outproduced this country. Because U S manufacturers no longer can produce at competitive prices, they are losing export markets, unless they establish plants abroad, and are feeling more keenly the effects of imports.

### Four ways to stop inflation

A four-point program is necessary to halt inflation and to keep America competitive, Mr Kraut said: 1) management and labor must join in holding down costs and in increasing productivity; 2) federal, state, and local governments must aim at balanced budgets to reduce taxes and thereby release more venture capital. And the federal government must liberalize depreciation policies; 3) protection must be provided American industry in the form of embargoes, tariffs or quotas; 4) Americans must drop their complacency and get to work.

"Education" was the theme of the two-day meeting. The premiere showing of the NMTBA's motion picture, "One Hoe For Kalabo," was the feature of the dinner session. Much of it photographed in a tiny village in Barotseland in the upper Zambesi valley in Africa, this 27½-minute sound-and-color film is designed to explain to the public what machine tools are and what they do. The picture was completed under the direction of NMTBA's motion picture committee of which Rowell A McCleneghan, Barber-Colman Co, is chairman.

### Bracket depreciation?

Elimination of Bulletin F and substitution of a bracket approach in depreciating capital goods were advocated by N M Forsythe, president, National Automatic Tool Co Inc. All depreciable property would be classified into a relatively few categories. Taxpayers would then be given a range or bracket of lives or rates or simply an upper limit which could be applied to assets in each category. A tax life of seven to ten years is being suggested for machine tools, though users could elect longer lives if they wish.

NMTBA is asking removal of the $2000 ceiling in the 20% initial life authorized at the last session of Congress, Mr Forsythe said. "We believe that in addition to the regular writeoffs, companies should have the option to write off an additional 20% of any machine tool purchases in the first year." He pointed out that the "true purpose of depreciation is to recover capital as it is consumed but companies take a pretty dim view of ploughing risk capital into new machines if it takes them 20 years to recover their investment. The factor of time—the length of the writeoff period—is in itself a real deterrent to modernization."

### Tax system shortcomings

The present tax depreciation system fails to recognize two important factors, Mr Forsythe emphasized: 1) accelerating obsolescence because machine tools become obsolete long before they wear out; and 2) inflation, because for every sound dollar you invested in a machine 12 years ago you can recover today a dollar worth only 50 cents or just one-half of the capital you actually consumed.

By contrast with the U S tax practice, foreign countries have shorter writeoff periods and special depreciation allowances serving as incentives to modernization, Mr Forsythe said. In France, new machines can be written off at 10 to 15% a year; in Sweden at 20%; in Switzerland at a 25% declining-balance rate; in Belgium at 15%. In England an additional allowance of 30% is permitted the first year, in France a double writeoff, in Austria 40%. If you are putting up a new plant in Italy, the depreciation period is reduced by two-fifths. In Germany, within certain limitations, 50% may be written off the first two years. India has a base rate of 10%, but if you are installing machines in a new plant, you can write off 125% of the cost, the extra 25% being called a "development rebate." In Canada all machine tools as a class have a 25% rate.

To secure early revision of the tax depreciation law, Mr Forsythe suggested that each association member see or write to his Senators and Congressman and give the facts also to his employees and to the people, newspapers and business clubs in his community.

### Bigger Exposition in '60

Opening the day after Labor Day in 1960 at the Amphitheater in Chicago, the next Machine Tool Exposition will provide "an advance look at what 40% of America's industry (that is the size of the metalworking industry) will be doing in the next few years," D H McIver, vice president in charge of industrial sales, Ex-Cell-O Corp, and chairman of NMTBA's Exposition Committee, predicted.

NMTBA is committed to a policy of holding an Exposition every five years—1960, 1965 and so on. Mr McIver remarked that with the overall business curve turned up, "I don't think that we have ever scheduled an Exposition better timed."

With the addition of Donovan Hall, more space will be available than in 1955. As was the case in 1955, the Production Engineering Show on Navy Pier will run simultaneously with the Machine Tool Exposition.

Of 44 firings of the giant Redstone missiles between 1954 and 1959 only two were considered unsuccessful, Brigadier General Joseph M Colby, deputy commanding general of U S

# metalworking market

Army Ordnance Missile Command, Huntsville, Ala, asserted. Fourteen successful firings out of 15 tries were achieved with the 1500-mile Jupiter. Army Ballistic Missile Agency is developing a cluster of liquid rocket engines of the type used in Jupiter. Assembling a cluster of these successfully tested engines will provide a thrust of 1.5 million pounds, thus hastening our ability to hurl much greater payloads into orbit or into space (Project Saturn).

Due credit should be given the machine tool industry for its contributions of new equipment for production of the Redstone and Jupiter missiles, General Colby said. He predicted that Army Ordnance Corps will spend more money in fiscal 1960 for machine tools than in the past year.

### 25,000 excess U S tools?

Annual rate of machine tools declared excess by federal government agencies may reach 25,000 this year, Niels A Olsen, director Metalworking Equipment Division, Business and Defense Services Administration, Department of Commerce, declared. Anticipating this trend, BDSA felt that the government's Tools for Schools program would be effective in retaining surplus machines in the mobilization reserve and also make them available to train better the nation's youth. Accordingly the annual rate of flow of tools to schools got up to 7000 last year and to 10,000 for the first quarter of 1959. "We would like to see this doubled or tripled," Mr Olsen observed.

### Improved Census by 1961

New procedures being developed by the Census Bureau will make possible by January 1961 the reporting of statistics truly reflecting by value and type the importation of machine tools, Mr Olsen revealed. Export data on machine tools also will be refined and improved.

If schools are to get the full advantage from the Tools for Schools program, machine tool builders can help by doing these things, according to Chester B Lund, director field administration, Department of Health, Education and Welfare: 1) tell local schools about the program, 2) aid them in developing shop layouts and tool requirements, 3) advise them on the operation and maintenance of tools, 4) counsel with them on the most needed types of training, 5) help them to place trained technicians, 6) help by creating a demand for new tools to round out and modernize these shops.

### Community relations

"If we handled our manufacturing, engineering and sales in the same half-hearted, slipshod, lip-service manner in which we handle our simplest relations with our plant communities, all of us would have been out of business 20 years ago," Alphons J John, manager employee and community relations Kearney & Trecker Corp, told members. Nevertheless, he sees some improvement in the machine tool industry's community relations. "Community relations is a program of action to earn community respect and confidence for a company. It also is doing the right thing, as a corporate citizen, and telling the right people about it in the right way."

Mr John mentioned, as examples of good community relations, a series of outdoor Sunday night symphony orchestra Pop concerts sponsored by the Norton Co and other Worcester companies, the televising of plant operations by Sheffield Corp for the benefit of the general public, and a series of local newspaper ads by Pratt & Whitney Co telling stories about people, such as a local boy going to college on a P&W scholarship. He also cited a tour of Kearney & Trecker's new plant in West Allis in 1953 by the City Fathers, bankers and service club officials and said that it was the first time that his company had been able to get across to local people what K&T does.

### The value of house organs

If you have an employee publication, see that it gets into the hands of the people in your community, Mr John advised. Not just the professional people, but barbers, bartenders, cab drivers and beauty parlor operators who see and talk with dozens of people every day. The use of films is another way to help cement community relations with your company. The showing of "One Hoe For Kalabo," the new NMTBA film, is a good example.

## What's needed in machine tool hydraulics?

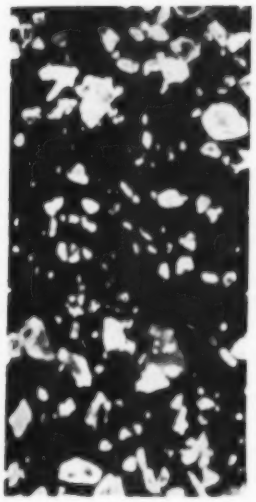
**U S** industry today is in need of hydraulic combination pumps of 3000 psi—to cut down on needed space, and to increase speed and capacity of machines (particularly presses) without increasing physical sizes. That's one of the opinions voiced by something like 150 users and builders of hydraulic presses, welding, die-casting, plastic molding and other hydraulic fabricating machinery at Vickers Inc's third annual Hydraulics Conference, held in Detroit on April 28-29.

Conference participants agreed, too, that leakage control is still a problem—a field in which nothing new has been developed in a long time. Among suggested ways of cutting down on leakage: (1) use the lowest practicable pressures and operating temperatures, (2) reduce shock in circuits, (3) use gasket-mounted sub-plates, (4) more liberal use of O-rings, (5) improve maintenance, and (6) use straight (instead of tapered) pipe threads. Some machine builders did, however, express doubt about the usefulness of straight-threaded joints in production applications.

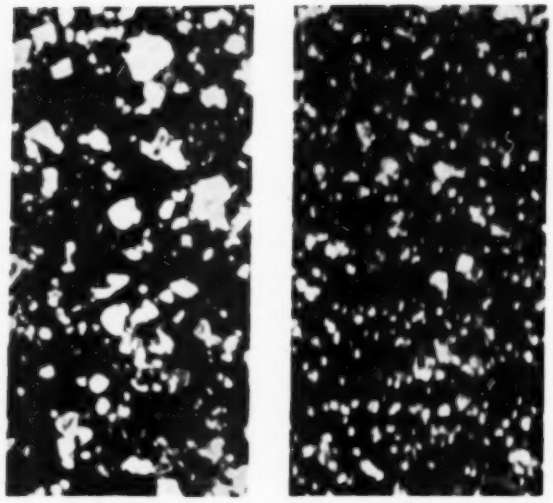
Discussion of seals, packing and the like brought out that there is as yet no universal sealing material on the market. But polytetrafluorethlene (Teflon or Viton A) comes closest to doing the job. Butyl rubber has its points, too—as a sealing material for die-casting machines that employ fire-resistant fluids.

Also discussed were filters for servo valves. Here, filters of 10 micron mesh seem to be best, should be installed as close to the valve as possible after the system has been flushed out, clean oil added, and maintenance practice set up. An oil company representative suggested that filters no smaller than 20 microns be used with emulsion-type fluids.

Summing up, keynote speaker Paul Rolnick of *Applied Hydraulics and Pneumatics* pointed out that designers and engineers need to know more about new hydraulic developments, and also cited the need for improved decceleration valves, higher-pressure equipment (above 5000 psi), better methods of cushioning cylinders, dimensional standards, larger valves, and more reliable low-pressure controls.



**Sludge from soft-resin-bonded wheel . . .**
. . . shows that natural diamond grit (left) recovered after test grinding has much larger, blockier particles than manufactured diamond grit recovered from sludge after grinding



**Sludge from hard-resin-bonded wheel . . .**
. . . Also reveals that natural diamond grit (left) recovered from test grinds is larger and blockier than manufactured diamond grit (right) recovered from sludge

**From the photographs above, South Africa's Diamond Research Laboratory concludes that manufactured grit because of its irregular shape and friability (crumbling quality) holds to a wheel longer BUT now the Laboratory has come up with a natural diamond grit from which hard-to-hold blocky particles have been sorted out or crushed into needle shapes and flat platelets. The new grit is claimed to be 40% more efficient than the old natural grit. You've read the case for manufactured diamonds (AM—Mar 23, '59, p 147). Here is . . .**

# *The case for grinding with . . .*

# NATURAL DIAMONDS

**Despite all the publicity and fanfare that have greeted development of manufactured diamonds as the greatest boon to precision grinding in recent years, natural diamonds have their points, too (no pun intended). This is especially true today with the recent development of a new natural diamond grit that is 40% more efficient than any of its predecessors.**

That in essence is what R G Weavind, director of research of the Diamond Research Laboratory, Union of South Africa, told the annual meeting of the Industrial Diamond Association at Williamsburg, Va, this week.

Said Weavind, "It is clearly indicated that the natural grit generally used in resin-bonded wheels can be improved by selection of particle shape and condition. To achieve the best result, grit intended for resin-bonded wheels should have the blocky particles *removed* and should have an irregular or rough surface to be most satisfactorily held by the resin. The particles should fragment relatively easily so that the bulk of the particle will remain embedded in the resin. The efficiency of wheels employing this type of grit will be up to 40% higher than with wheels containing the conventional type of natural grit."

And Diamond Research Laboratory has come up with such a grit . . . one which Weavind claims disproves the theory that only blocky diamond material should be used in grinding wheels of any kind—whether they are resin, vitreous or metal-bonded.

Natural diamonds crushed down to grinding sizes not only are blocky in shape, but become needles or even thin flat plates. Now, these various shapes can be separated out, and this was done for a series of tests conducted by Diamond Research Laboratory.

The tests, according to Weavind, proved that the more blocky the particle in resin-bonded wheels, the poorer the grinding. That's because such blocky shapes dislodge easily. At 5500-sfm wheel speed, very blocky diamond shapes achieved an efficiency ratio of 14, compared with 22 for needles-and-blocks shapes, and 25 for needles-and-flats shapes.

Thus, Weavind maintains, it is clearly evident that any advantage manufactured diamond grit may have over natural grit lies in its

rough, uneven exterior and its relative friability, rather than in its blocky shape.

Weavind claims, too, that manufactured grit is so friable that particles are reduced in size during manufacture of the wheel, resulting in extensive breakdown in the larger grit sizes, and even more so in 100 mesh and smaller sizes.

Only way to overcome this deficiency, Weavind claims, is to crush the material lightly with mortar and pestle to break down the more friable particles and leave a hard core better able to stand the strain of manufacture. But, he adds, this adds considerably to the cost of wheel manufacture.

It is Weavind's contention that "the more the shape of natural grit particles approaches needles and flat platelets, the better they are held in the resin and the more efficiently do they operate in the wheel."

The best grit for resin-bonded wheels, he says, should have a rough or irregular surface, and should "be in a condition where the particles will break down into small fragments under impact (friability)."

Blocky particles should be avoided in resin-bonded wheels, Weavind believes, and are best for metal-bonded wheels and saws, where operating pressures are higher and the blocky shape enables them to be firmly in bond. This takes full advantage of their resistance to abrasion.

### Challenges validity of tests

Weavind in his talk before the Association also took exception to those test methods for diamond wheels which have shown manufactured diamonds to be more efficient than natural ones. Such tests, he said, don't take into account variations in the internal hardness of the carbide test pieces and variations in the wheels themselves. Not only that, he added, the use of micrometers to measure wheel wear is also prone to inaccuracy.

Diamond Research Laboratory has just undertaken more than 600 tests involving 145 resin-bonded diamond wheels—tests designed to overcome errors caused by hardness variations in carbide test pieces and in wheels. Too, DRL's method takes into account the hardness of the resin from which the wheel is made—particularly important when blocky shapes are used.

At the laboratory, three Jones & Shipman production grinders were fitted with ball-bearing wheel heads so that they could be operated at 4500, 5500 and (if necessary) 6500 sfpm. All wheels used in the tests were of the D1A1 (DIT) type—6 in. dia, 3/16-in. face, 1/8-in. depth of resin, grit concentration of 100.

The grinding wheels were tested by traversing them back and forth across 24 tungsten carbide (each $1\frac{1}{2} \times \frac{3}{4} \times \frac{1}{2}$ in.) cemented together on a cast iron base to form a 6 x 3 in. specimen. The wheels make 50 passes in each direction, or 100 in all.

At each change of direction the wheel is fed down either 0.001 in. or 0.005 in., depending upon whether the grit in the wheel is coarser or finer than 115 mesh Tyler. Cross-feed for each traverse is at a rate of 0.50 in. per stroke. Table speed is maintained at 44 fpm. Results are expressed as a ratio of the volume of carbide removed to the volume of wheel wear, known as an "efficiency ratio."

With each test, the wheels are reduced in diameter by 0.010 in. to 0.020 in. and the carbide is worn down by 0.090 in. or 0.080 in. as the case may be.

Wheel wear is measured with a toolmaker's microscope, which unlike a micrometer, is not affected by heat expansion of the wheel or by protrusion of the diamond particles from the wheel face.

Diamond Research Laboratory's test procedure also compensates for such variables as hardness of the carbide test pieces. This is measured by the Bergsman micro-indentation technique, because neither the Rockwell nor Vickers methods have proved sufficiently sensitive.

To measure effect of hardness variation on grinding test, DRL took a grinding wheel made with natural diamond grit, mounted it on a grinder and trued it. The wheel was then worn down 0.007 in. to insure that the surface of the wheel was in its normal condition for grinding and unaffected by truing. A new specimen with only sufficient carbide removed to level the surface was then substituted and grinding continued until the wheel wore out. At every hundredth pass the grinder was stopped and measurements taken of wear on the wheel and the carbide.

It was found that carbides have a hard skin—that once through it grinding becomes easier until the center of the specimen is hit, when grinding becomes slightly harder. Wheel efficiency, it was found, drops away rapidly as the last 0.025 in. of resin wears down. In most cases the wheel wore out before the carbide test specimen.

DRL's procedure also takes into account variations in grinding wheels, and it was found in test after test that the last 20% of each wheel is unserviceable for accurate testing.

Weavind maintains that insufficient polymerization of the resins used in a wheel can also affect tests markedly, found that if such insufficiently polymerized wheels were subjected to a reheating their efficiency increased markedly.

### Effect of resin grades

Grade of resin has a considerable effect on grinding with manufactured diamonds, Weavind claims, but far less with natural diamonds. For example, a normally shaped natural grit set into a hard grade of resin shows only a 10 to 15% increase in efficiency as compared with the same grit in a natural bond. Manufactured grit, on the other hand, improves its efficiency greatly when set into harder resins.

Proof of this, Weavind says, can be found in the grit recovered from sludge after grinding. Grit from natural diamond wheels contains many more coarse diamond particles than manufactured grit. The greater quantity of coarse diamond particles found in sludge from the wheels containing natural grit indicates that a resin bond (soft or hard) has difficulty holding natural grit particles that have smooth surfaces and blocky shapes.

On the other hand, the predominance of fines (fine particles) in the sludge from manufactured diamond wheels indicates that not only does the irregular shape of such material allow it to be held more firmly in the resin, but its friability is such that the more firmly it is held the more it breaks into smaller fragments. And because manufactured grit breaks down into small fragments instead of being dislodged in larger pieces, the diamonds stay on wheels longer.

**Thus Weavind and his associates at Diamond Research Laboratory conclude that if relatively friable natural diamond particles with rough or irregular surfaces are used in resin-bonded wheels, top grinding efficiency will be achieved. And if the blocky particles, which dislodge easily from resin, can be removed from the natural grit before bonding, grinding can be still further improved.**

And this has now been done by Diamond Research Laboratory, as described at the beginning of this report, to produce a natural grit 40% more efficient than any natural grit ever developed.

# Air + electronics + hydraulics position parts to ±0.0005 inch

**Flexibility of manufacture is markedly broadened by a new positioning table developed at the plant of The American Tool Works Co, Cincinnati, Ohio. Available as a positioning device for any point-locating application, the system was demonstrated on an American Hole Wizard radial drill which has a 7½ hp head and a roller-bearing-mounted spindle. This combination offers heavy-duty production drilling and boring plus accuracies for tool work that normally would be expected only from a jig borer. The control system is a product of Sperry Gyroscope Co.**

Numerically controlled by an endless, one-inch-wide, eight-channel punched tape, the new 8000-pound positioning table is designed to support heavy work. Two sizes, 20 by 30 in. and 30 by 30 in., are available. Positioning accuracy claimed for the system is ±0.0005 in. but all of the demonstrations, including heavy cuts, showed an accuracy better than ±0.00025 in. on either axis. Also, the system design prevents cumulative errors. The table will repeat a position within ±0.000050 in. and, according to the engineers, the table has the ability to hold these accuracies even when installed in the shop, without temperature control, because the material in the feedback elements has a similar coefficient of expansion to that of the material in the table itself.

Hydraulic actuation, using pistons in cylinders instead of leadscrews, provides powerful, smooth, and fairly rapid operation regardless of the weight of the part. Positioning speed can be controlled as a function of the accuracy required in hole location. The table travels automatically from one position to the next, moving simultaneously on both axes ($x$ and $y$), at the same speed from start to finish of movement—yet with no overtravel. Because the hydraulic actuating cylinders are in a balanced closed circuit, the table is rigidly held in position when the pistons are at rest. No clamps are necessary to lock the table during machining.

As a demonstration, the operator at American Tool Works split a thousandth of an inch into tenths. He attached a tenth indicator to the ways and then, under tape control, advanced the table to click off ten increments of 0.0001 in. each on the indicator, stopping after each move. Sperry Gyroscope, in its own laboratory, had not attempted a test this severe.

Basically this control system utilizes a combination of pneumatics to read the tape, electronics to transfer the information, and hydraulics to move and hold the table. Heart of the system is a Sperry Gyroscope electrohydraulic rotary valve, originally developed to control aircraft landing gear actuation, which accurately meters hydraulic fluid in response to electrical signals.

An endless punched tape can be installed in the control system cabinet in a few seconds. Using the endless tape means that, as soon as one piece is finished the machine is ready for the next piece without rethreading the tape. The tape may be inserted under the low-pressure-air reader in any position because the control unit will automatically locate the starting block of information. This "start" usually is the loading position; it directs the table to travel to its fur-

thest fron position. At this location, the operator can load and unload with a hoist, if necessary.

Low-pressure air, passing through the holes punched in the tape, reads a block of information at a time by actuating a series of switches. These signals are fed to a resolver in the electronic control system to indicate where the positioning table is to move (in terms of "x" and "y") to arrive at the next working location

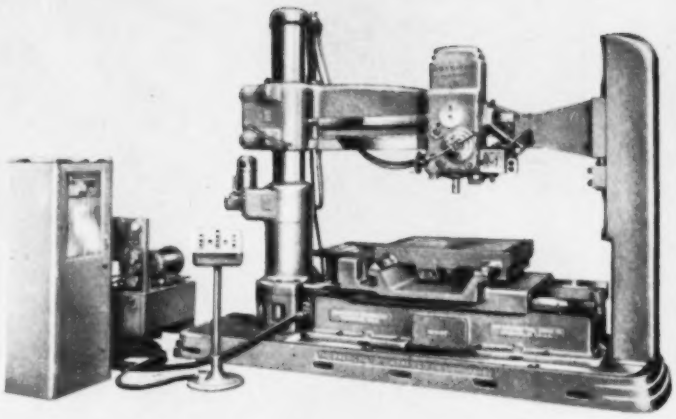
Feedback signals—which tell the electronic system where the table is presently located and announce its arrival at the new position—are supplied by two Farrand Inductosyn (electronic) scales; one each on the "x" and "y" coordinates. Each scale is made of glass having embossed wiring and is read by a slider which maintains a 0.005 in. air space away from the scale surface, hence there is no physical contact and no wear between the scales. Signals from the Inductosyn units, too, are fed to the resolver.

From the resolver, signals are issued which represent the difference between where the table should be (from the tape) and where it is (from the feedback). These signals are sent to the electrohydraulic rotary valves, which control the flow of hydraulic fluid to the cylinders—and the position of the table. When the desired location is reached the valves move to a null position and the hydraulic circuit is blocked, thus locking the table in place.

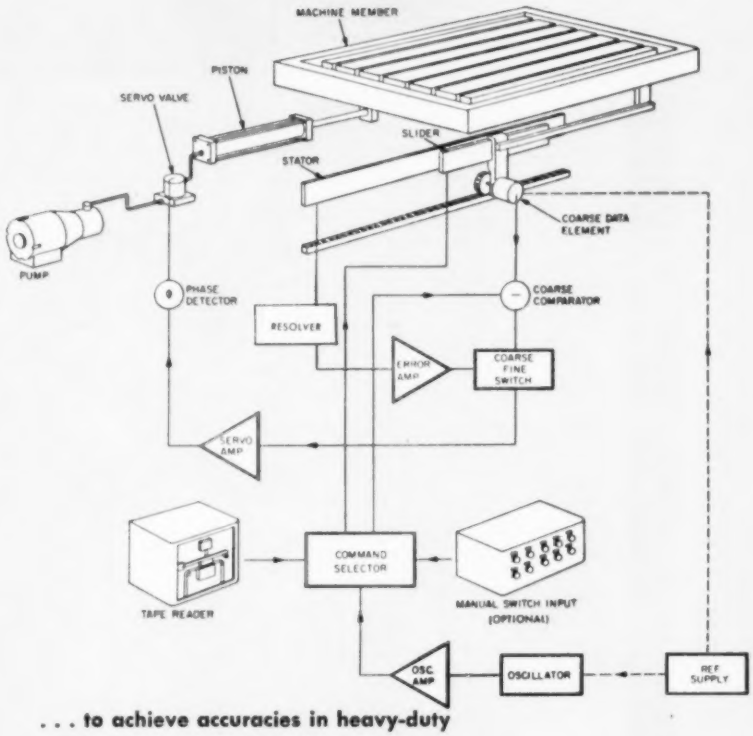
### 7 hours work in 2

The control circuit contains no memory unit other than the tape itself. Because the air reader reads one block of tape, consisting of the "x" axis location, the "y" axis location, and any special instructions at one time, it is unnecessary to store bits of information until a complete block is ready to release—as in some other systems. The punched tape does not move ahead to digest information for the next position, but travels only from position to position as the machine work-cycle progresses. Thus, by simply pushing two buttons, the operator can move out of position and back again to try a gage in a bore.

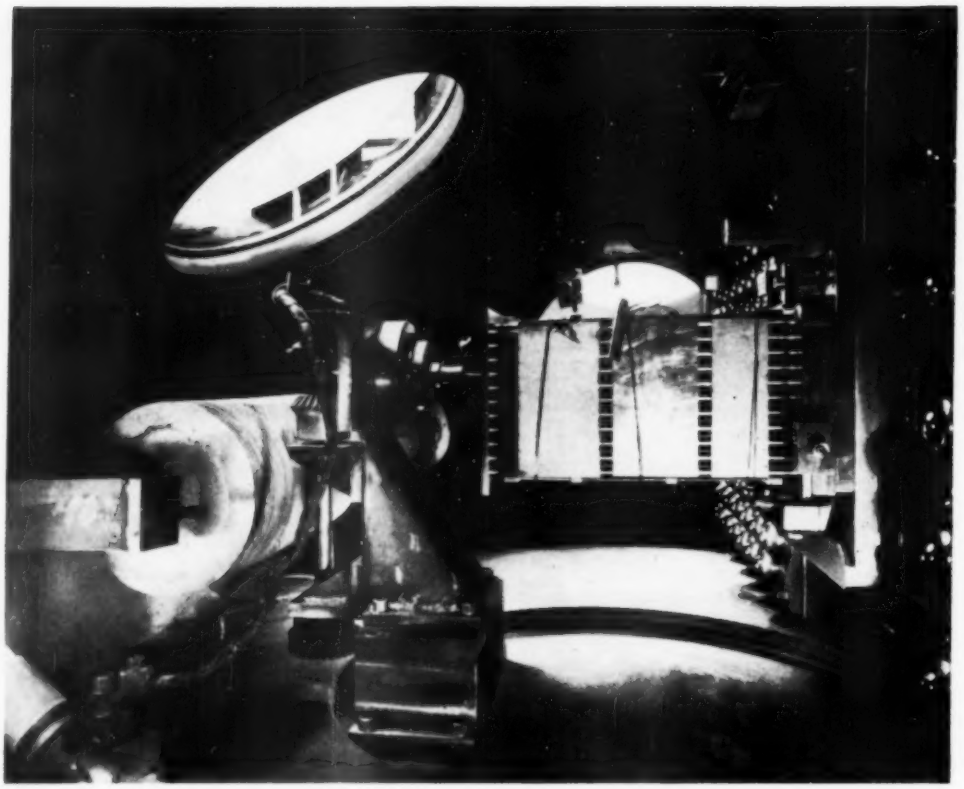
One job at American Tool Works, for example, normally takes seven hours on a conventional boring mill. The new setup completed it in less than two hours. In another demonstration, gear-case covers were drilled and spotfaced with a 30% reduction in floor-to-floor time and at a saving of $2000 in tooling.



**Tape-controlled positioning table, installed here on an American Hole Wizard radial drill, works this way . . .**



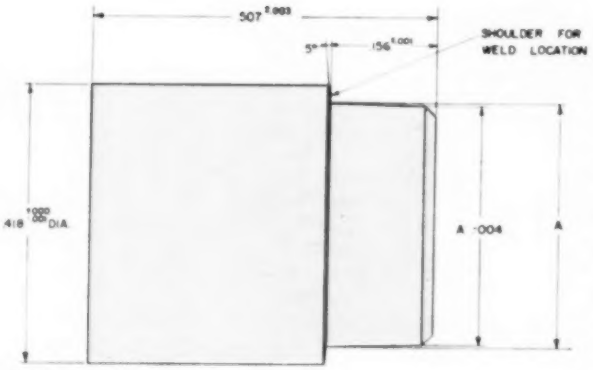

**. . . to achieve accuracies in heavy-duty production boring and drilling up to now attainable only on a jig borer**



**Rod ends were welded . . .**
to sheets by electrode that described circular path to make a ⅞-in.-dia overlapping joint. Inert atmosphere was required for the fusion weld

# Zirconium welds join

By J Glatter, E G Schwartz, W L Frankhouser, and J H Eyler,
Westinghouse Electric Corp, Pittsburgh, Pa




**End caps . . .**
were tapered at the nose for weld backup. Dimension A was categorized from 0.3645 to 0.3635, to 0.3625, and to 0.3615 in. This produced force fit in tubing at assembly in vertical press

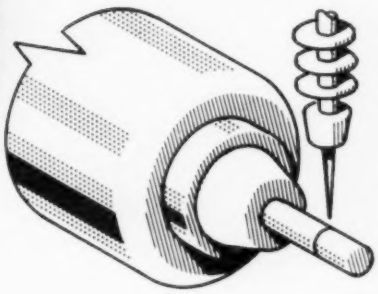
**Critical assembly job . . .**
was to fusion-weld end caps to zircaloy-2 tubing, particularly second end cap when uranium-dioxide fuel slugs were installed

**Fusion welding turns the trick when zirconium is assembled to precise tolerances. Westinghouse credits properly controlled and sequenced fusion welding for success in building zircaloy-2 blanket parts for the Shippingport (Penna) atomic power plant.**

Core sections for the pressurized water reactor are made up like heat exchangers, with 9-in. tubes and rods of zircaloy-2 plus end caps assembled between zircaloy-2 end sheets. Each assembly is a fuel-rod bundle, with rows of uranium-dioxide pellets loaded inside the tubes. End sheets are drilled so water can circulate through the spaces between rods and end plates.

Zircaloy-2 is applied to this and other nuculear reactors because it combines corrosion resistance to

**Weld setup . . .**
was made in vacuum chamber under inert atmosphere. Chamber load of 400 pc was welded in 1 hr, with work power rotated



# parts for atomic power plant

high-temperature water with low thermal neutron absorption. But the main difficulty with zirconium is that it combines with oxygen and nitrogen at elevated temperatures, and nitrogen particularly affects corrosion resistance. For this reason the welding was done in an atmosphere of helium. In addition, the metal parts had to be cleaned and recleaned throughout the process to prevent surface impurities.

Tubing was supplied by vendors after it had been extruded, machined, and bench-drawn to 0.421-in. OD and 0.357-in. ID. Mechanical tolerances were unusually close, and the tubes were proof-tested at 5000 psi and inspected by eddy-current test.

First fusion-welding process joined one end cap to a tube, assembled with 0.001-0.003-in. interference fit. Production welds were 100% inspected by X-ray; after experience with the material, rejections at this point ran only around 6%. Stacks of fuel pellets were weighed, then inserted in the tubes. Helium atmosphere was required inside the assembled tubes —another reason for welding in an inert atmosphere.

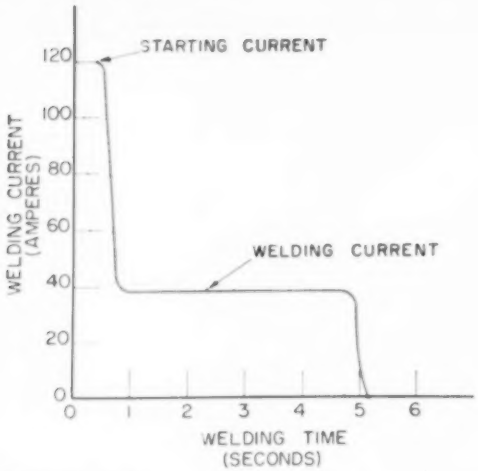
**Welding experience showed that cavities and porosity contributed to a 12% rejection rate for the second end-cap weld, but results were improved by increasing revolutions in the weld cycle from 1.1 to 2.1 and controlling the starting current at 120 amps.**

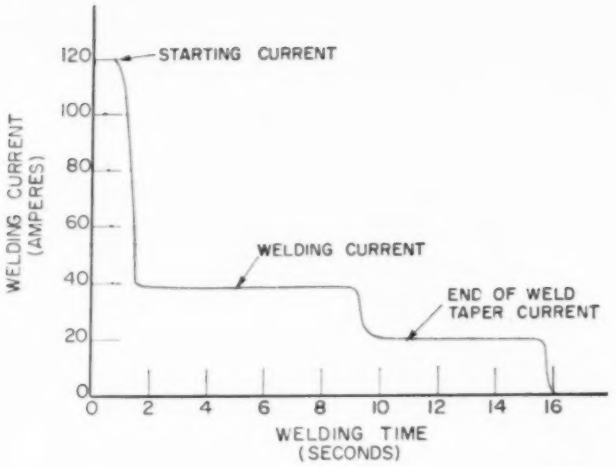
X-ray and dye penetrant inspection, then cleaning, vapor-blasting, pickling, and corrosion tests at 750 F and 1500 psi followed. Pinholes were rewelded with low amperage, then recycled through all final-inspection and cleaning steps. This technique was generally successful, and it salvaged practically all the rods in which pinholes were found.

Each fuel-rod bundle was assembled with 113 fuel-bearing tubes and 7 solid rods (for structure) of zircaloy-2. Interlocking strips of mild steel were joined to act as spacers before tubes were welded to end sheets. Light tack welds were made with inert-gas-shielded tungsen electrodes with high-frequency arc initiation to prevent tungsten contamination.

Tube ends were welded to the end sheets under careful control of pattern, timing, current, and sequence. Each weld was cycled for 200-amp arc initiation, 180-amp welding arc, and 20-amp crater elimination. The welding electrode was rotated in a 0.290-in. circle over each rod end to overlap adjacent welds.

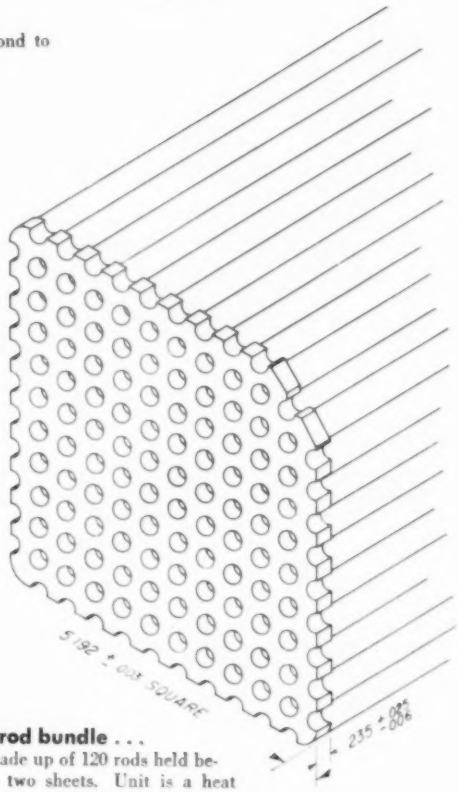
## Zirconium welds . . .




**Welding cycles . . .**
were similar for first and second end caps, but taper current was required on second to counteract internal pressure buildup and increased mass (fuel added)

**Tack welding holds rods . . .**
to allow handling before final welding. Rod alignment was controlled by mild-steel strips inserted through bundle




**Fuel-rod bundle . . .**
was made up of 120 rods held between two sheets. Unit is a heat exchanger, with water passages between rods; holes in end sheets

Setup and tack welding were done carefully to make sure the fuel-rod bundle was assembled into an accurate rectangular block. Bundle-dimension tolerances were calculated to prevent distorted shrinkage between any two of the rods; the overall bundle outline had to fit the required volume exactly, and the surfaces of the tube sheets had to be held distortion free. Cooling stresses from the welds were controlled partly by the welding sequence and standards of current, time, etc.

Stress-free fuel-rod bundles were produced after they were clamped and vacuum-annealed. This required slow heating to 1275 F, hold for 3 hr, then slow cool to under 200 F. Annealing improved corrosion resistance of the material because it produced a slow inward diffusion of surface contamination at the heat-affected weld zones.

Bundles were then milled at the ends, drilled for water passages, and fully inspected again. Then they were assembled into a 7-ft-long shell made by fusion welding strips of zircaloy together with a technique similar to that applied to the tubes. Final acceptance was only after corrosion, helium-leak, and dimension tests.

# Decisions or devices?

**"Joe, I'd like you to set up a committee to work out a new distribution system."**

**"Joe, (six months later) it's obvious that those people you picked aren't aware of the problem. The warehousing centers seem all wrong. Why don't we call in a consultant; get him to find the answer with a computer or Operations Research or something?"**

**"Joe, (two years later)—only reason I can think of why those new warehouse locations aren't producing is that we don't really know what motivates our customers. Let's get one of these psychology experts to tell us what makes 'em tick."**

And so it goes! In thousands of companies, every day, devices—gadgets, surveys, studies, committee reports, computer analyses, brainstorms, ad infinitum—are taking over the role of decision making. Management is giving these tools equal (or greater) status with itself. The servant is becoming the master.

**Management must stop leaning on the "expert" and must return to making more of its own decisions. This sharp warning comes from Robert B King, president of Profit Counselors, Inc (New York City), an expert himself in dealing with management people and their problems.**

Even the manager who is wrong part of the time will build a stronger structure for his company and himself if he learns to make, and trust, his own decisions. Devices and experts are tools which can help him by providing pertinent data, thus give him more time for decision making, but they rarely are competent to make that decision.

"A manager who looks to new developments in management consulting, motivational research, electronic data processing, phychological testing and similar techniques," King said, "as the *answer* to his decision-making responsibilities is deluding himself. I have yet to see a part-time expert, computing machine, or group-decision-making apparatus that could replace a competent manager running his company with common sense."

**In spite of the rapid growth of scientific and "professional" management, and the greater number and complexity of factors to be considered, decision making still is a prime management responsibility—no different than it was 100 years ago. New techniques extend the capabilities of the staff that selects and evaluates the factors to be used in reaching a decision. They rarely offer a "safe" answer on their own.**

Regardless of the reason—whether fear, insecurity, competitive pressure, insufficient knowledge, lack of time, or any of the countless other possibilities—the manager who uses a crutch, like the addict to a drug, pays for temporary pleasure with ultimate, more strongly imbedded, disability.

To help management see the extent of its "leaning," Mr King has prepared a set of seven weaknesses to watch; the list is shown at left.

## Seven weaknesses to watch

**1. Make your own decisions.** Keep the expert, machine and committee in its proper place—as a dispenser of the facts needed for a decision. Don't let the availability of an expert turn you into an apathetic manager. Decision making is *your* job.

**2. Stop blaming Uncle Sam for your troubles.** Using the income tax laws, reciprocal trade agreements, etc, as scapegoats isn't going to solve your problems. Looking to Washington for answers can become a dangerous form of rationalization.

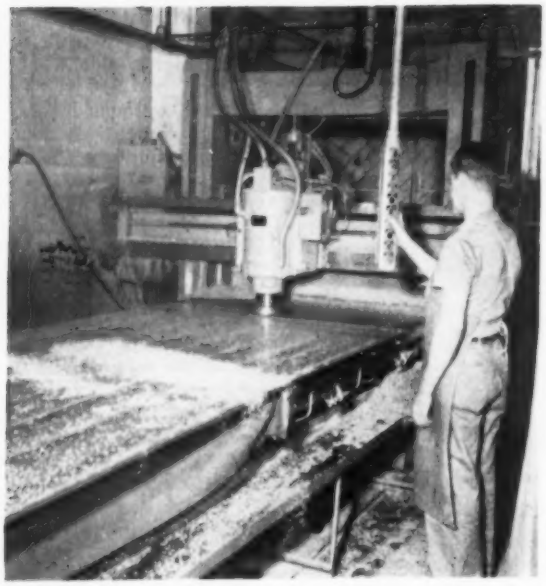
**3. Stop depending on human relations to solve your problems** and start solving them as a manager. The "goody-goody" approach isn't going to improve your relations with anyone. You can't be all things to all people at the same time. If the stockholders don't get their dividends because you were too generous with the union, you may find you did neither the employees nor yourself any good.

**4. Stop playing follow the leader.** Your company is different, regardless of the competition in your industry. At least it better be if you want it to survive. Concentrate your efforts in making it different, via better product, better service, better *something*. Imitation may be the sincerest form of flattery but *it* follows and *you* must lead. Very often the result of mental poverty, imitation is a poor replacement for imagination.

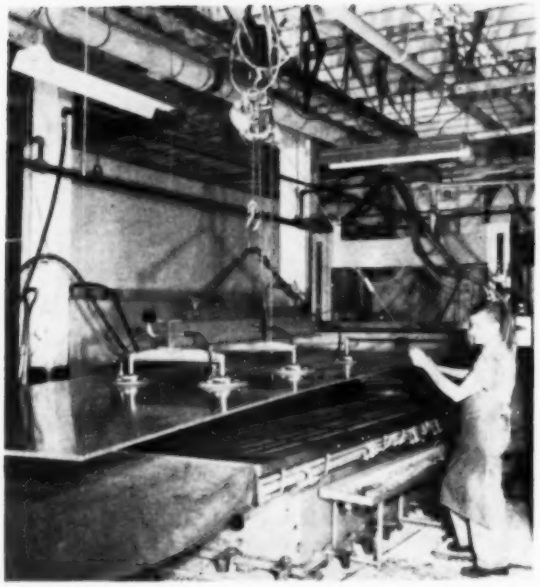
**5. Don't be in awe of statistics** or you may become one. Industry averages, ratios, forecasts, etc, are only as good or bad as your ability to use them. The business climate is never pre-ordained by what comes out of a machine or, for that matter, an expert.

**6. Don't play games with current management fads.** They can be expensive toys. Automation, Operations Research, etc, may be just what you need, and then again they may not. Look for, and use, new ideas in thinking but only in the amount your operation can absorb.

**7. "Think," as the famous IBM sign says.** But don't stop there. Put your thinking into action. Philosophers aren't expected to show a profit; you are.



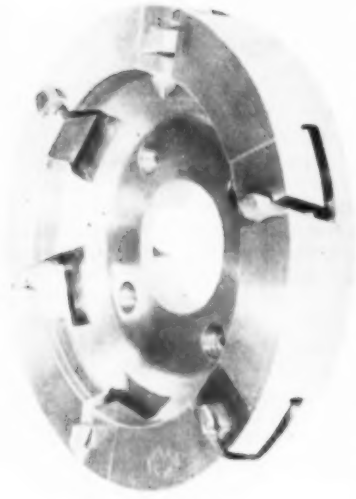
**Modified standard planer . . .**
has a new crossrail and a 30-hp Ekstrom-Carlson motor head that mills aircraft skin panels. Machine has a 4-ft reinforced-concrete foundation, and is optically aligned



**Sheet handler . . .**
is a frame with six 10-in. vacuum cups that grip aluminum-alloy plates up to 62 x 222 in. and ¾ in. thick. Unit picks up sheets to and from miller table

# Smart tooling eases a machine

By C M Theien,
vice president, Ekstrom, Carlson & Co, Rockford, Ill



**Flywheel cutter for skin miller . . .**
has a 12-in. OD and six carbide-tipped bits clamped with wedged, corrugated gibs. Cutting faces are at 15° positive axial rake, 5° clearance, and zero radial rake. Cutter rotates at 3600 rpm

**tandard machines—with modifications—do a number of non-standard operations at Ekstrom Carlson,** where aircraft skin panels are now being fabricated as part of a diversification program. Standard shop equipment is being applied because production quantities for the first aircraft-structure orders would not justify special equipment to handle the large aluminum 7075ST plates. Therefore the shop had to adapt and modify what equipment it had on hand.

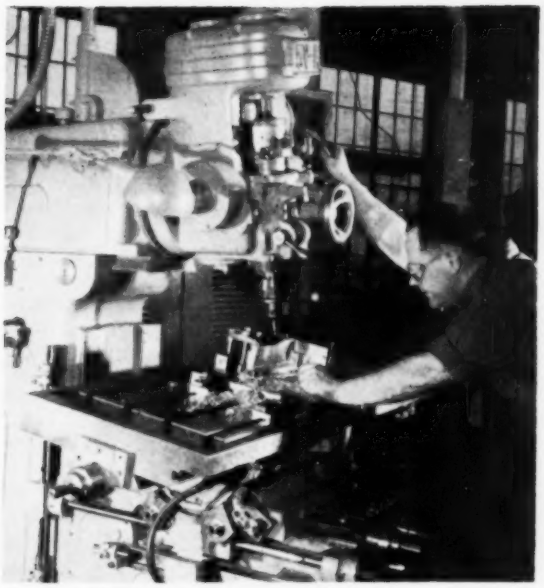
One obvious requirement was a skin miller. This was produced by adding a new high-speed milling head and a new crossrail to a standard planer (see photo). The machine does face milling in any direction under either table or slide feed. A special flycutter makes full-depth roughing passes and 0.005-0.01-in. finishing passes at 140 and 80 ipm, respectively, though feeds are infinitely adjustable and can be changed for other jobs.

The table is now equipped with a sectional vacuum chuck that will hold a single large part or one or several smaller parts. Each table section has separate vacuum controls, so few vacuum ports must be masked off if the whole table is not covered. The same vacuum system that powers the chuck also operates a six-cup vacuum lift frame with which panels can be handled to and from the table.

## Simple Setups

Other machining operations include drilling, routing, and profiling. These are placed at large tables equipped with two Profile-Mills each or with double-arm V109 router drills. Two working spindles at each table speed the machining; also permit working on two smaller parts at the same time.

Single-flute HSS spiral cutters do the profiling. These are stronger, cut more freely, and produce better finishes than standard two-flute cutters. Holes are drilled by polished-flute twist drills with 120°-angle points, operated by automatic reciprocating air-driven heads. Double-arm machines have one drilling head; the



**Compound-angle setup . . .**
at 5VA Vertimil does the work of elaborate tools. Both table and head are angled; HSS and carbide tools cut airframe parts at speeds up to 2480 rpm

**Two heads . . .**
on a V109 Routerdril let operators do two operations at once. One is a drill head, one a 5-hp, 14,400-rpm router; both equipped for overlap templets. Other head is over table to rear

# builder into airframe fabrication

other head is for rough routing with 5/16—¾-in.-dia cutters. These are guided by steel or aluminum templets that control 1.125-in. followers for roughing and 1.062-in. followers for finishing.

### Accuracy

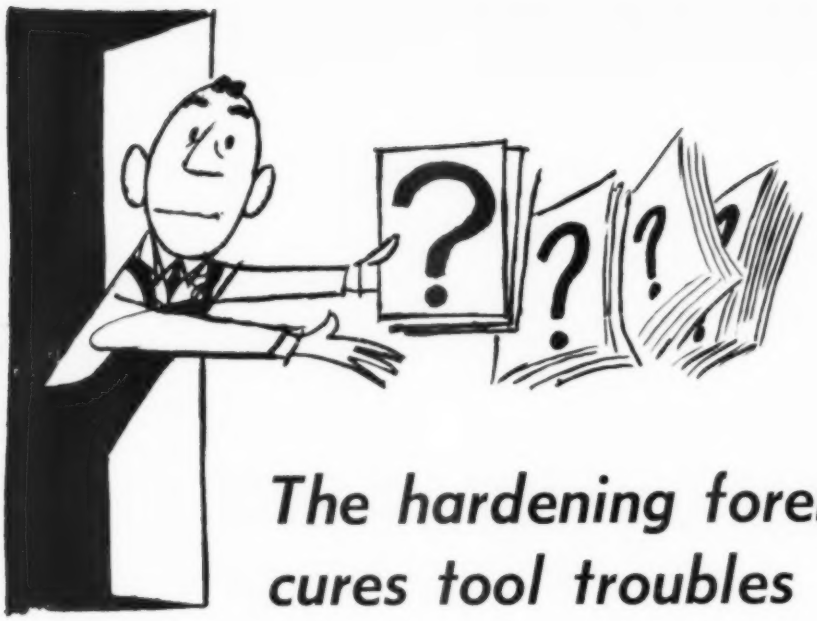
Inspecting procedures include a check of large-sheet thickness after face milling. An electronic gage measures within 0.001 in.

Final dimensions of the wing panels are checked in as many as 10 spots in a 3x3-in. area—some of the larger parts require more than 6000 dimension checks to an average tolerance of 0.003 in.

Coolant for skin milling is a 120:1 mixture of Vantrol base in water, applied by spray mist at 20 psi. Routing and drilling operations are cooled by 100:1 Lusol base in water, usually applied as spray mist.

Contracts from a number of aircraft companies for components provide a broad base for manufacturing operations; in addition they help discover new applications for Ekstrom-Carlson machines.

**Double-machine setup . . .**
places two No. 480 Profile-Mills beside a 5x24-ft T-slotted aluminum-faced table. HSS cutters at 14,400 rpm rout one large part or two smaller ones



# The hardening foreman cures tool troubles

Some years before my retirement as foreman of the hardening room, Scovill Mfg Co, Waterbury, Conn, a company representative came into my department to look us over. Before leaving he said, "This is the most important room in the factory. You can have one of the best diemakers, use the best steels, and yet the tools will be useless unless they are properly hardened." His words stimulated me to look for ways to improve tool design with respect to potential sources of trouble in heat treatment. As problems came up, I wrote them down in question form and later the answers. This article cites some of our experiences that you can pass along to your people. It is a sequel to my earlier article (*AM*—Jan 12, '59, p 122) that gave answers to common questions asked by shop personnel about heat-treating procedures.

By Charles Doescher

**What causes large redrawing punches to crack when quenched in water?**

Abrupt changes in section will be a major cause of breakage. A certain redrawing punch, Fig. 1, was first made with a small-diameter air hole *A*. The punch cracked along line *B* when quenched.

If you study this punch, you will see that the working end, up to the threaded hole for the punch holder, is a heavy section. The upper portion is much thinner walled because of the threaded hole. When such a part is quenched, the upper section cools first, then contracts to "pull" against the heavier part, causing the crack.

To avoid this trouble, we changed the punch design to call for a much larger air hole, as shown at *A* in Fig. 2. The larger hole does not conflict with redrawing nor the shape produced at the bottom of the shell. With this change, we got almost uniform distribution of metal in the upper and lower sections of the punch. No longer did we experience punch cracking by reason of unequal cooling rates.

**What would you do if the punch had to have a *small* air hole at the bottom end?**

We would drill a large air hole, as before, then counterbore the hole at the punch end. Then after hardening of the punch, we would lightly drive in a hardened air-hole plug, as in Fig. 3.

**What is a good way of handling a redrawing punch during heat treating?**

The best way that we found was this: Make an eye bolt with an air hole, Fig.4. If made of machine steel, the eye bolt will not harden and can be used over and over again.

The bolt was made a loose fit in the punch-holder hole in the punch, and was screwed into the punch before the latter was placed in the furnace. By using a light, quick-acting rope tackle, we could quickly transfer the heated punch from the furnace to the brine quenching tank.

**Should a tool like a redrawing punch be quenched until stone cold?**

The answer is "No." A water-hardening punch or die will be as hard as it can get, if it is removed from the water when it can just be grasped and held with the bare hand. Play the game "safe." While it is still warm, plunge the tool into the tempering oil to eliminate cracking from thermal shock. We kept a small movable tank of tempering oil, heated to 325 F, close to the brine quenching tank. A tool like the punch under discussion would be held in the oil for up to 5½ hr.

**Should the pin-driving holes in the punch be hardened?**

No. To prevent cracking in the region of the driving-pin holes during hardening, the holes are filled with putty. The low anneal before hardening bakes the putty in place, so that it is held securely during quenching.

**How deep should an air hole be drilled in a long punch?**

The ideal method is to drill the

air hole through the punch shank. The hole will not weaken the shank to an appreciable extent, and is ideal so far as hardening-room problems are concerned.

If you think you must use a cross hole in a long punch, make sure that the lengthwise air hole is drilled at least ½ in. beyond the cross hole. We noticed that the punch always cracked, as at *A*, Fig. 5, when the axial hole just met the cross hole. A crack never occurred if we drilled past the cross hole.

You will often get extra use out of redrawing punches if the axial and cross air holes meet near the shank. This is true even though the punch is made originally for a relatively short shell. Often a job comes along involving a longer shell, and a punch of the exact size can be found among inactive tools.

**Can discarded punches be reworked?**

There are times when a few thousandths can be ground off a discarded punch to make it suitable for "that new job." But remember that you can't grind much metal off a punch because water-hardening steel does not harden all the way through. As you know, redrawing punches as well as redrawing dies should be glass hard and absolutely free of soft spots. Furthermore, redrawing punches must be ground and polished smooth (with just the slightest taper), to permit easy stripping of the shell.

**How do you make the stripping edge on a redrawing die?**

To permit reworking of worn redrawing dies, we use water-hardening steel. When the die is worn out, it is annealed at 1300 F and hardened again. In many cases, this treatment shrinks the die enough so that it can be re-used. Frequent rehardening causes the dies to crack if the stripping edge is made sharp. So instead of a sharp corner, we use a radius at *A*, in Fig. 6, near the stripping edge. This modification provides much more life.

**What is a good material for clutch keys?**

Clutch keys on large- and medium-size presses operate under heavy shock and are therefore easily broken. The situation is more serious when a small rush order comes along, and we try to do the job on a small press, because a machine of suitable capacity is not available. Sometimes the press will do the job, but often a clutch key is broken before the order is completed. Then we have to rush around and make a new key.

This happened to us twice in the same day. We had run out of the special steel that we *then* used for clutch keys. Because of the emergency, we took a chance. New keys were made from machine steel by this procedure:

1. Pack in one-half old and one-half new granulated bone.
2. Carburize at 1600 F.
3. Quench in oil.
4. Heat thoroughly at 1450 F in an open-fire furnace.
5. Quench in brine.
6. Draw at 375 F for 1½ hr for small keys and 2½ hr for large ones.

To our surprise the carburized machine steel keys gave better results than ones of the special steel we were *then* using.

**What is a good method for heat-treating a set-edge for a die?**

Tool steel set edges are fastened on top of a die to position the sheet-metal blank in proper relationship to the working parts of the tool. These set edges are long, thin parts and often gave us trouble in hardening, until we hit upon this method.

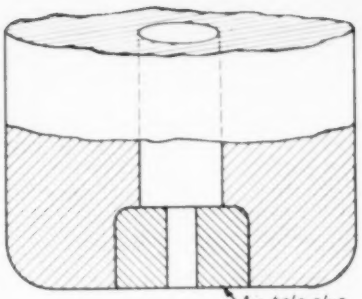


Fig. 3

The set-edge that gave us the most trouble was ¼ x 5 x 12 in. and had a center hole measuring 2¼ in. wide by 9½ in. long. We moved a bench close to a cyanide pot and placed a large bench block on top. A fireclay dam was built up around the sides of the block. Into the shallow cavity so made, we poured hardening oil to a depth of ⅜ in. The set-edge was now heated to 1450 F in the cyanide pot, quickly placed in the shallow oil bath and another bench block placed on top of the set edge moved about in a circular fashion. In this way, we were able to quench the set-edge and at the same time to keep it flat.

Right here, I should say that we rehearsed in advance how this job should be done. By so doing, we could work quickly on the actual job without making slips. It pays on fussy hardening jobs, particularly those requiring two or more men, to rehearse the operation before heating the tool. Then, each man knows just what he must do and when.

**Which steel is best for forming dies?**

We had trouble with a die for forming up steel blanks 1/16 in. thick, because one section of the blank had to be left a trifle thinner than the remainder. For this strenuous operation, our problems were solved when we used chrome-nickel steel hardened by this method:

1. Heat to 1525 F.
2. Quench in oil.
3. Draw at 350 F for 3 hr.

**What is a good way to heat treat a blanking die for thin material?**

There are times when a new oil-hardening steel blanking die has to be given a 100% hardening job, be-

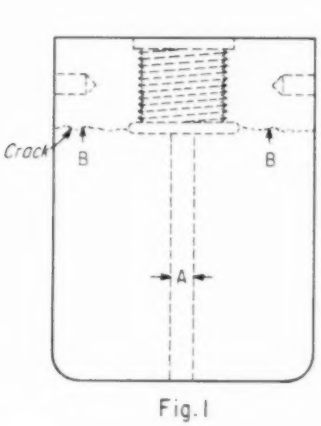


Fig. 1

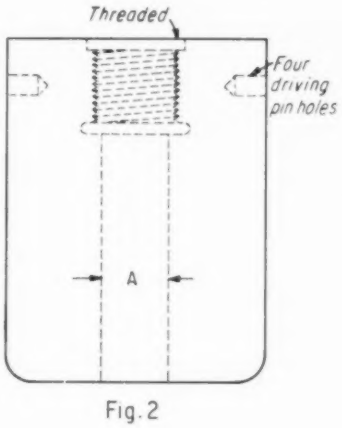


Fig. 2

cause the punch is already made and it must cut very thin metal. This means that the die must be nearly a perfect close fit to the punch after hardening.

We found that the best and cheapest way in the long run was to harden the die in this manner:

1. Pack in old ground bone (not too fine).
2. Heat gradually to 1450 F.
3. Quench in a salt bath at 375 F.
4. Transfer to cold oil when cooled down to 375 F.
5. Draw at 400 F for 2 hr.
6. Wash off salt in hot water, dry in sawdust.

Pack carburizing in this case acts to insure a slow heating rate which is always an important factor in helping to keep dies from changing shape. It also insured a clean-hardened surface on the face of the die, with no soft spots or decarburization.

**How do you avoid warping a long, thin die?**

We badly warped a stamping die made of water-hardening steel. This long, thin die, shown in Fig. 7 was given a low anneal, straightened, and then annealed again to remove all strains. Instead of using a single stream of water as we did in the first place to harden the working part of the face of the die, we used an upper and a lower stream. This change gave us an A-1 job. The upper stream of water kept the lower stream from forcing the die to bend upwards, and the lower stream kept the upper stream from forcing the die to bend downward.

**What is a good way to anneal a punch shank?**

We found that this procedure is the best way to anneal the shank of a high-speed-steel tool, free of cracks, while leaving the working part hard:

1. Gradually warm the shank over a gas flame to 350 or 400 F.
2. Gradually immerse the shank in a lead pot heated to 800 F.
3. Raise the pot temperature slowly to 1600 F and hold at that heat for 1 hr.
4. Bring heat down *very slowly* to to 1000 F.
5. Remove tool from lead pot and brush off lead.
6. Cool on floor.

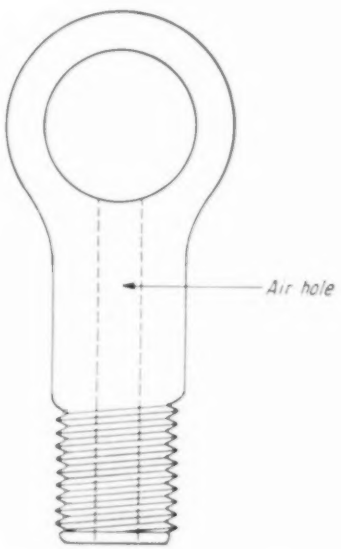


Fig. 4

## Further Suggestions from Experience

(Also see AM—Jan 12, 1959, p. 125)

**1. If a tool is not sufficiently hard, give it a low anneal before hardening the second time. The anneal will relieve strains caused by the first hardening, and prevent the cracking of the tool in the second hardening.**

**2. A tool that is not heated through before quenching in water or oil will not properly harden.**

**3. Fast heating of any kind of a tool or die will cause it to warp.**

**4. Sometimes the man who makes the punches forgets to drill the air holes on punches that require them. If they are then hardened and straightened, they have to be annealed, the air holes drilled, and the punches hardened over again. To avoid this trouble have the hardening ticket state, "no air holes" when they are to be left out. The hardener will thus know what to do.**

**5. Better results are obtained in hardening large air-hardening steel dies, say 12 x 18 x 1 in. thick, by standing them up while they are being heated.**

**6. Never harden a tool on a descending heat. Hardening a tool on an ascending heat always makes for a better hardening job.**

**7. The best time to anneal fairly heavy steel pieces that require lots of time to cool slowly is to place them in automatic shut-off furnace late Friday afternoon. You have until Monday morning to heat and cool the pieces and avoid tieing up a furnace during regular working hours.**

**8. Persons removing hardened tools from the Hardening Room should sign the hardening ticket to avoid misunderstandings and mixups.**

**9. When the Hardening Room is running one shift, it pays to have a dependable night watchman instructed on how to light up the furnaces and have them at the required heat at 7 a.m., to eliminate waiting time on the day shift.**

**10. In this connection, all furnaces, lead pots and cyanide pots should be numbered, and the Hardening Room should have a record of the time the watchman gets to the department on his rounds.**

**How do you check operating conditions of a controlled-atmosphere furnace?**

With up-to-date controlled-atmosphere furnaces, little or no trouble should be had in hardening dies and tools. However, it should be stated that suitable atmosphere conditions are necessary to insure the ideal hardening of tools. You must avoid excess air or oxygen. All fuel-fired furnaces must be operated so that the chamber is heated by a neutral or slightly reducing atmosphere. An oxidizing flame will decarburize the tools. They will have a soft skin, under which will be found "spotty hardening," i.e. hard and soft spots. An oxidizing flame will also ruin and pit the clean finished surface of a die or tool.

To find out if the furnace chamber has a neutral or slightly reducing atmosphere, proceed in this way: Take a piece of ½-in. steel rod about 2-ft long. Point one end and fix a wooden handle on the other end. Then force a small piece of wood onto the pointed end and insert into the furnace chamber through the peep hole. If the atmosphere is reducing and O K the wood cannot burn. It will turn black and show intermittent flashes of blue flame. If the atmosphere is oxidizing, the wood will burst into flame. A very good point to remember is that a furnace atmosphere that will not burn wood will not burn or pit steel.

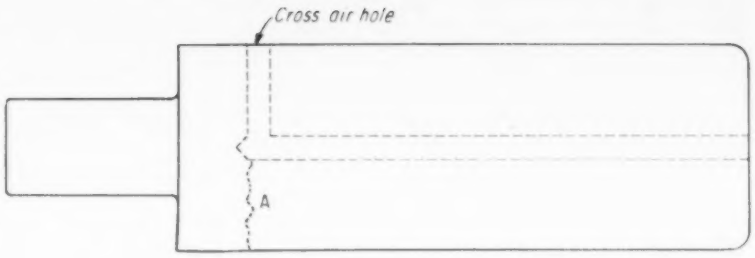



Fig. 5

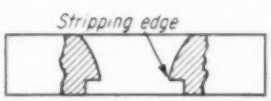



Fig. 6

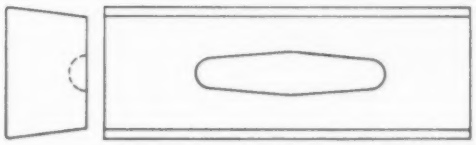


Fig. 7

**How do you "close in" a die?**

It sometimes happens that the hardener gets careless and causes the die to slightly open up, particularly when handling an oil-hardening steel die. The die can be saved by first giving it a low anneal. When cold have the blacksmith close it in slightly by a few light blows on all four sides on the steam hammer. There is no need to heat up the die unless it has opened excessively. In cases where a die must be closed in, and is made out of a round die blank, it can be easily closed in by using the half-round shoes which are part of the equipment of every blacksmith-shop steam hammer.

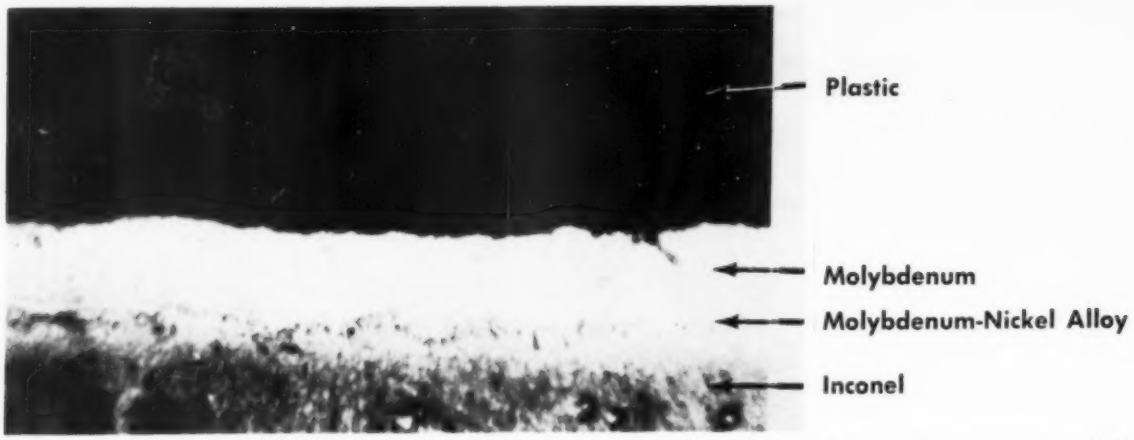
After the die has been closed in, it is given a low anneal to remove strains induced by the hammer blows, then checked and touched up by the diemaker. Finally, the die is hardened by the correct heat-treating procedure.

# Why Planes Cost a Mint

One reason is the complex wiring harnesses installed to control and power complex electronic and electrical gear. Chance Vought Aircraft makes the best it can of a tough situation by making a single one-piece main harness that can be installed in an F8U-1 Crusader with a crane-handled carrier.

The harness has 400 wires and is 40 ft long. The carrier is 32 ft long, but weighs only 75 lb because it is built of 2½-in. aluminum tubing. The carrier is lowered over the wiring board, the harness is transferred to the carrier with rubber straps that hold the harness to contoured shape that will fit the plane, then the carrier is rolled to the plane and the harness installed. Two men do the installation; it took 16 formerly.

The single harness requires fewer connecting plugs and weighs less than multiple harnesses. The carrier prevents bending and chafing wires.




**Coating** of molybdenum on Inconel produces a bearing surface that can be used in molten salt baths. Photomicrograph at 200X

# Electrophoresis - a new coating tool

By **Robert A Keeler**, senior development engineer,
**Louis C Terminello**, new projects engineer,
Vitro Laboratories, West Orange, NJ

**By applying electrophoretic deposition, metals, alloys, cermets, and solid lubricants can be bonded to virtually any metal with minute control of thickness, absolute uniformity, and low power consumption.**

Special coatings to resist high-temperature oxidation, erosion and corrosion, as well as to obtain high-temperature lubrication, can now be applied to a wide variety of materials by utilizing the phenomena of electrophoresis and electro-osmosis. Developed industrially by Vitro Labs, the technique has been employed for applying molybdenum on steel, silicon carbide bonded with nickel on mild steel, molybdenum disilicide on graphite, nickel chromium on molybdenum, and molybdenum disulfide-copper on stainless.

Electrophoresis is the movement of charged colloidal particles in a liquid by application of an electrostatic field. If two electrodes are immersed in a prepared suspension and a potential applied to them, a deposition of the suspended material forms on one of the electrodes. The technique was employed a number of years ago in the production of rubber gloves and for depositing Alundum on electronic tube parts. Vitro, however, discovered that if a porous conducting body is placed between the electrodes, impregnation of the pores will take place, instead of deposition. This discovery has been developed into a special technique called electro-osmotic impregnation.

Although similar in theory to electroplating, electrophoresis and electro-osmosis are concerned with the motivation of charged particles. Electroplating deals only with surface charges.

## Mechanics of the Process

Electrophoretic deposition is usually carried out in four or five separate steps, depending on the materials to be deposited. These steps include: preparation, deposition, reduction (if necessary), isostatic pressing, and sintering.

The suspension is prepared usually from commercially available powdered solids by dry mixing the powders with a small percentage of an activator and blending directly into a solvent vehicle, usually nitroparaffin. The nature of the activators has not been disclosed and they are considered to be proprietary. However, their use markedly increases the stability of the dispersion and density of the deposited film, and makes possible the use of dispersions without ball-milling. The activators also serve to increase the charge imparted to dispersed particles, thus boosting their driving force and resulting in greater coating density.

## Deposition

In practice, the coating is obtained by connecting the workpiece as one of the electrodes and immersing it in the suspension. Since the charge on the dispersed particles is a specific property of each system, its sign must be predetermined and the current directed to attract the dispersed phase to the proper electrode. Thus, the charge on the particles is determined by the material being dispersed and the solvent vehicle.

Coating takes place rapidly. Deposition rates of several kilograms per amp hr are obtained, and coatings of 5 to 10 mils thickness may be deposited in 15 sec.

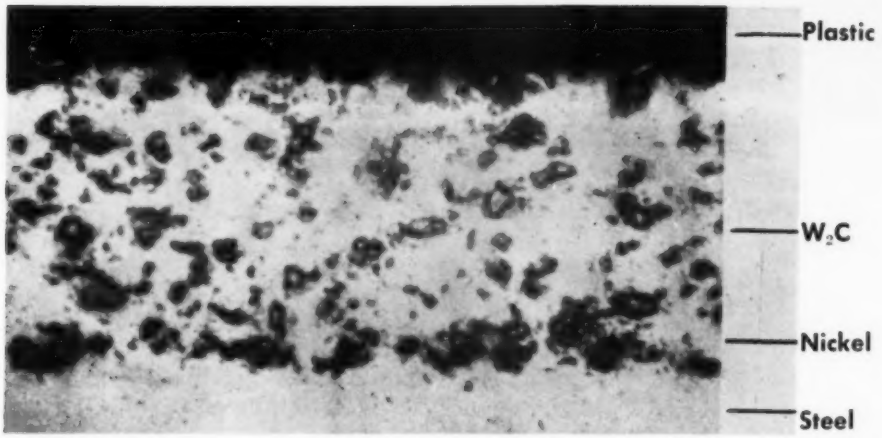
Deposition rate is controlled by a balance of many factors, including distance between electrodes, dispersion, concentration, voltage, particle size, and particle charge.

One of the basic characteristics of electrophoresis is uniform deposition. As the coating deposits on a sharp edge, an insulation effect results and the current shifts to more remote areas. Thus, uniformity is inherent in the process. As deposition progresses, any thin spots which may develop offer a lower resistance, causing a current shift to the thin areas and an increased deposition at these points until the coating is built up to uniform thickness. Coatings are packed firmly and uniformly on the substrate but are not in themselves structural elements.

In cases where it has been necessary to deposit metal oxides, the coating must be reduced in a hydrogen atmosphere before further treatment to produce pure metal.

## Bonding

The "green" coating must be sintered or bound together and to the substrate before it becomes a continuous adherent coating. The coated object is enclosed in a thin rubber casing, air is evacuated, and the casing is immersed in a suitable fluid, usually glycerine. The enclosed object is then subjected to pressure of




**Composite coating** of nickel and tungsten carbide on a steel base is obtained by using the desired proportions in the bath

from 10 to 50 tons per sq in. at room temperature for a few minutes.

The work is then removed from the casing and fired in a suitable atmosphere at a temperature sufficient to sinter the coating. Codeposited activators are vaporized and the metal particles flow together in a continuous film. Under the influence of heat, the coating and substrate interdiffuse forming a metallurgical bond resistant to thermal and mechanical shock.

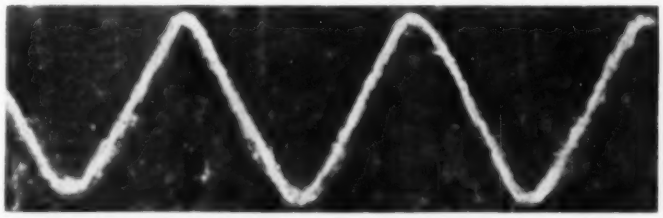
### Electro-osmotic Impregnation

This process differs from electrophoretic deposition in that the particles in dispersion must be smaller than the pores of the body to be impregnated. Under the same operating conditions as electrophoretic deposition, the article to be impregnated is placed between the electrodes. As the particles move through the solvent, they impregnate the pores of the article until all voids are filled, creating a dense, impermeable coating.

In variations of these methods, it is also possible to simultaneously deposit a mixture of metals, to coat non-conductors on metals, to build up alternate layers of metals and non-metals, or to coat non-conductors with non-conductors.

### Industrial Applications

Using these techniques, Vitro has developed a variety of composite coatings for special purposes based on metals, alloys, cermets and ceramics. Of particular interest is the coating of graphite with oxidation- and erosion-resistant materials. Because of its unusual physical stability and strength, graphite is an ideal base for objects to be used at high temperatures, and coatings of molybdenum silicide, silicon carbide, niobium carbide, molybdenum disilicide-nickel (94%-6%) and tantalum carbide have been successfully applied to it.



**Coated screw threads** show the extreme uniformity of coating obtained by electrophoretic deposition

High temperature wear-resistant lubrication coatings, such as molybdenum disulfide and copper on stainless steel, and boron-nitride-copper-nickel on stainless are applicable to moving engine parts for use at extreme temperatures and pressures.

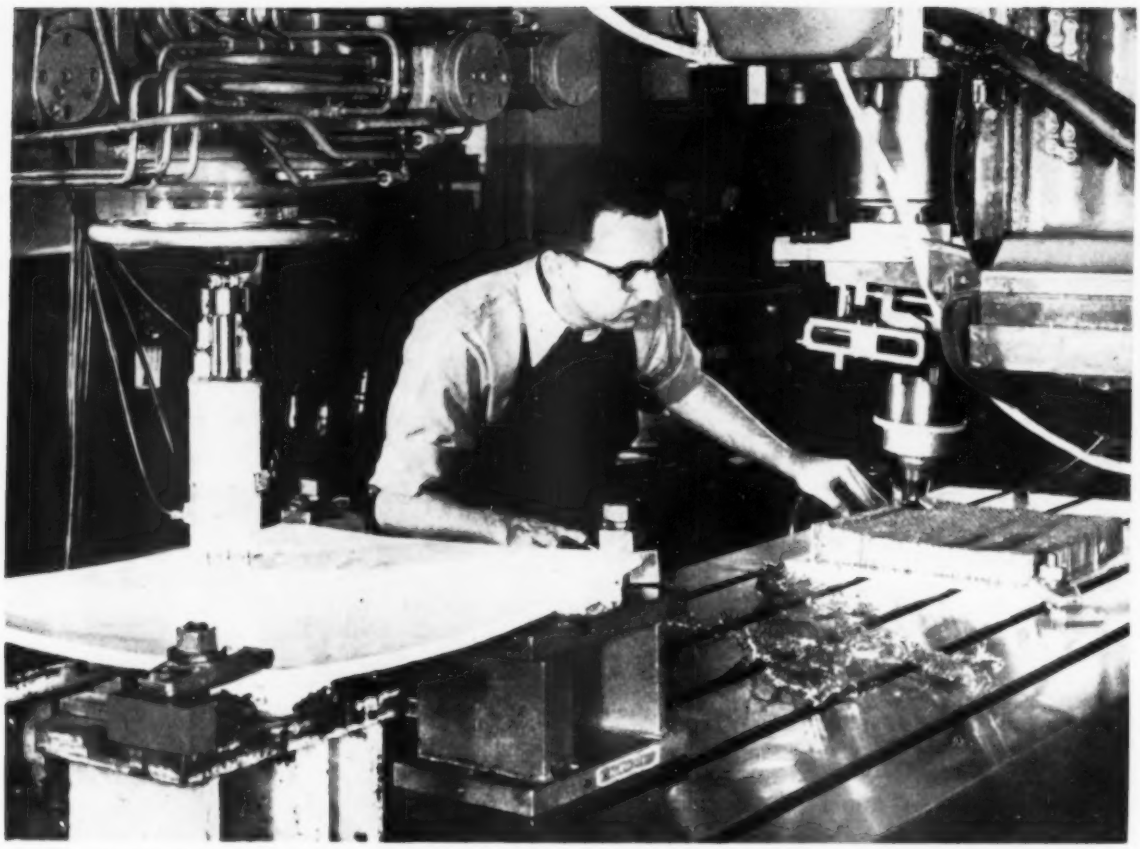
Chromium on inconel, molybdenum on steel, molybdenum on inconel, and molybdenum on croloy exhibit unusual resistance to molten metals for pump lining applications. Coatings of interest to the nuclear industry include uranium dioxide impregnated in silicon carbide, uranium dioxide-nickel (20%-80%) on stainless steel, uranium dioxide-molybdenum, molybdenum chromium on molybdenum, cerium oxide-nickel on steel, inconel on mild steel, and iron-nickel-chromium on copper and steel.

It is anticipated that Vitro will apply a high-intensity electric arc in the production of pulverized metals for the preparation of coating dispersions. In the arc it is possible to produce pure metal particles less than one micron in size which are ideally suited for electrophoresis. This will provide pure metal particles that are not commercially available today for further coating developments.

Also under development are new processes in which electrophoresis will coat non-conductors with non-conductors of electricity. Industrial applications will soon be available.

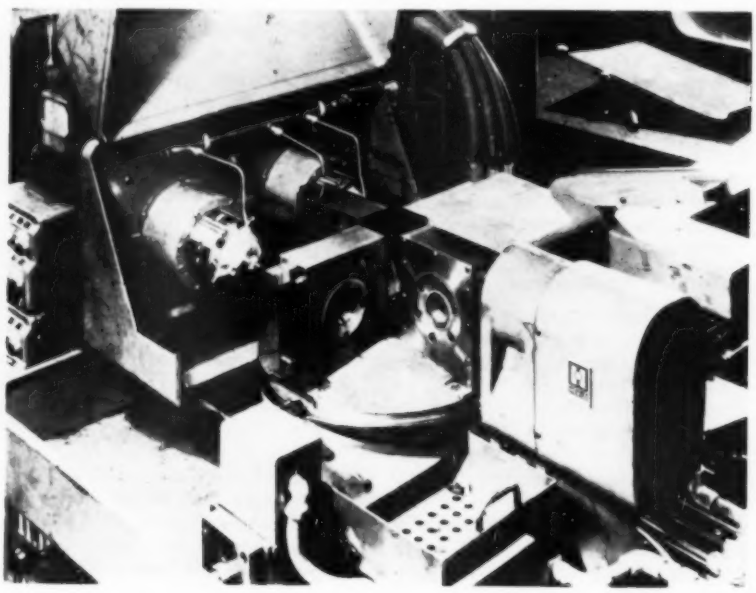
This new method of deposition claims distinct advantages over other methods. Deposition rate is high and current costs relatively low. Uniformity of coating is insured because the deposit always has the same composition as the dispersed phase, even when the suspension contains several different kinds of particles. Surface finish depends on the size of the particles used, but is, in general, extremely fine. It is free from orange-peel effect. In this connection, however, it should be noted that electrophoretic deposition will not improve an existing surface finish. If there are pits in the work, they will be coated with exactly the same thickness of material at the bottom as will the smooth surface. For example, screw threads may be coated with the assurance that the same thickness will be achieved at the roots as at the crest.

This coating procedure, when coupled with the high-intensity arc's ability to produce fine particles, may offer solutions to some of the pressing problems in coating and electrical miniaturization.

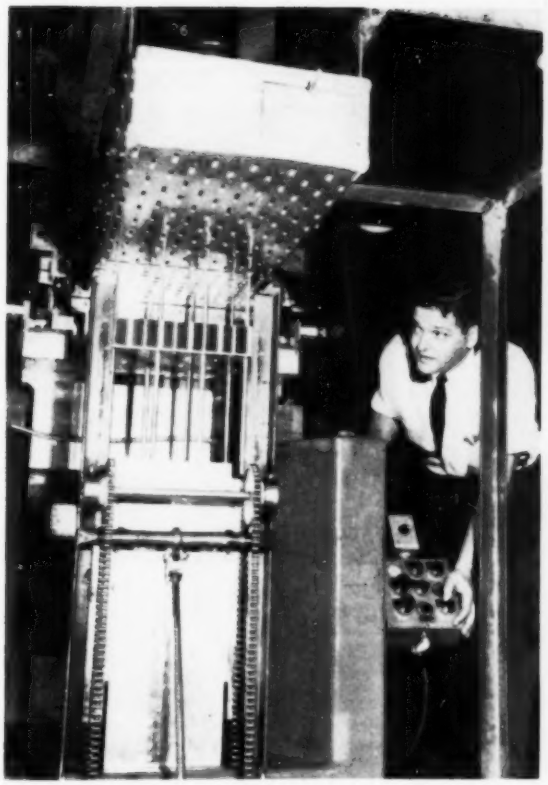


**"Hula head" contours 3-D honeycomb . . .**
Three-dimension contours in unsupported honeycomb are machined by a tilting spindle that follows a five-point stylus. Machine is controlled for rise and fall and tilt 10° in any direction by stylus on contoured model. First application is on Titan components, built by Martin Co, Baltimore

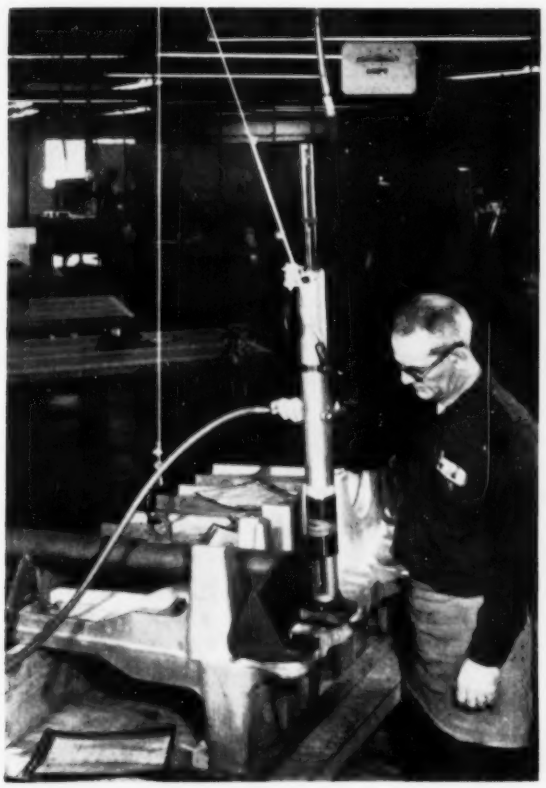
# SHOP SHOTS



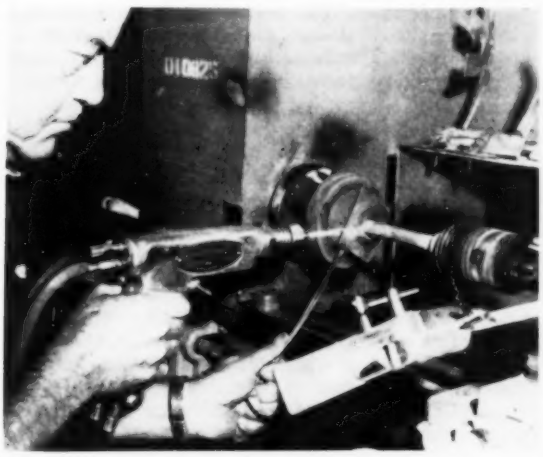
**Both ends are machined at one setup . . .**
A mechanized Heald Bore-Matic bores, faces, and recesses both ends of roll sleeves that are fed automatically to the four-fixture rotary table. Feed-out quills are operated by table index to machine 0.012-0.018 in. of stock from each bore. Table rotates 90° each stroke, presenting front face to one quill, back face to the other. Production is 105-210 parts/hr on several sleeve sizes. Part is rejected to chute as new part is inserted by hydraulic plunger. Setup is at Whitin Machine Wks, Whitinsville, Mass

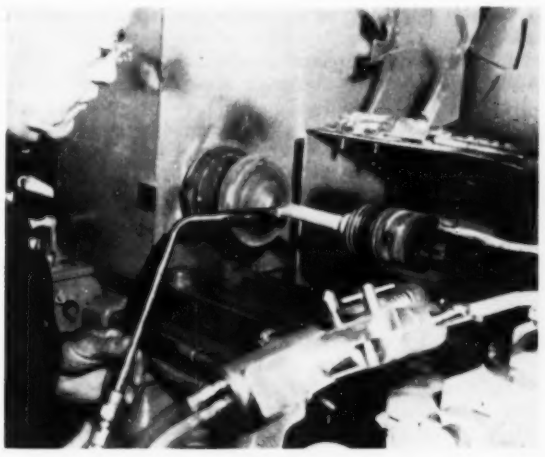


**Vacuum controls thin aluminum fins . . .**
Aluminum strips for fin-and-tube heat exchangers are now only 7 mil thick; too thin to drop properly over stacking pins. Stacking fixture is reworked to hold strip as it feeds from punch press against overhead vacuum plate. When strip has fed out to length, vacuum is momentarily broken and fin floats down onto pins. Fins are counted until full number is stacked, then another pin fixture indexes into catching position. Heat exchangers are built at Westinghouse, Staunton, Va

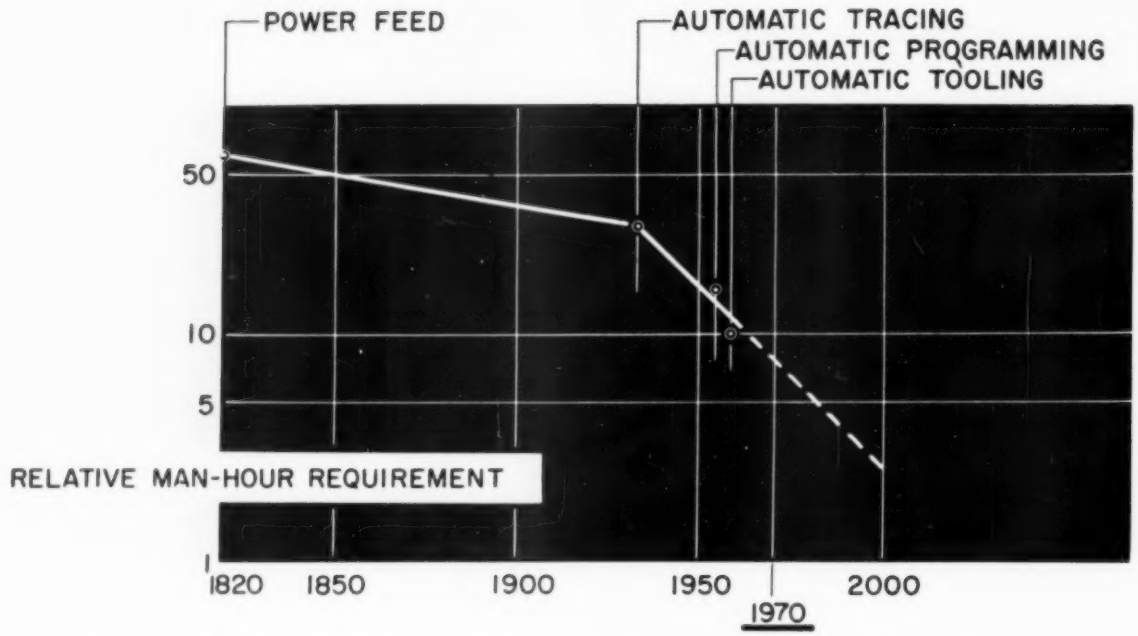


**Hoisted fixture locates drill . . .**
Convair F-106 spars are drilled by one man with an air-feed drill and fixture that locate on the work from overhead. Counterbalanced fixture is easily positioned; and it has adjustable pads that locate it accurately. Equipment was built by H & B American Machine Co





**Worn engine valves are reclaimed . . .**
Powdered nickel-base alloy is sprayed onto valve stems, then fused with oxyacetylene torch. Final operation is to grind the hard surface. Navy operation saved nearly $2 million in three years by reclaiming 50,000 valve stems—now repaired for $6 each instead of $40.00. Stems are prepared by undercutting 0.05-0.007 in. deep, then grit blasting so spray will hold. Nickel alloy protects from corrosive marine-engine gases




**1—Automation improvement . . .**
shows up as man-hour requirements drop. Innovations are noted at the year each was introduced to practice. Chart vertical scales are all logarithmic

# 10 YEARS AHEAD . . .
# *What's in it for metalworking?*

By M Eugene **Merchant,** director of physical research,
The Cincinnati Milling Machine Co., Cincinnati, Ohio

**Metalworking is going to face a triple challenge in the ten years ahead Versitility, accuracy, and productivity in machine tools are going to improve—and at a rapid pace.**

But how rapid and in which direction? Predictions can only be based on past performance, by following established trends. However, there are a number of definite trends that can be plotted and extended into the future. Some of these trends are so strong that they follow a logarithmic curve and can be plotted almost as straight lines on logarithmic charts.

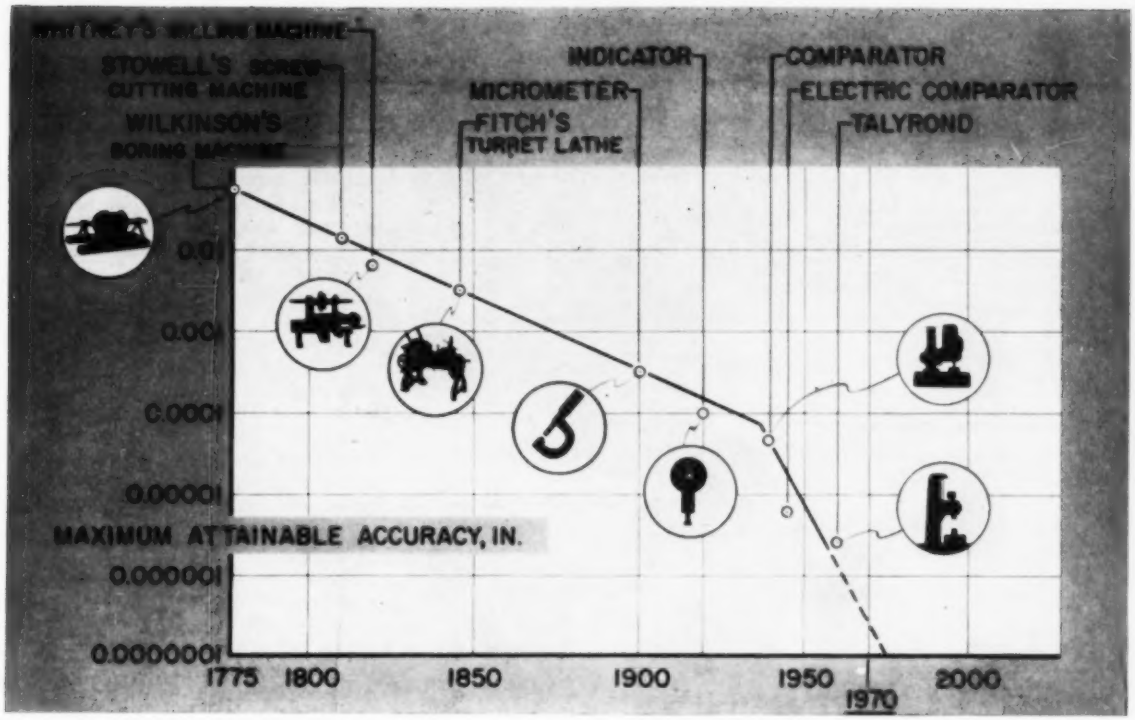
**Versatility, the first challenge to metalworking, means automatic control; and it's been improving right along** (chart 1). It started with power feed in 1820, and continued with automatic tracing in 1935, automatic programming in 1955, and automatic tooling in 1959. Man-hour requirements (which are an inverse measurement of machine control) have trended steadily down, and there appears to have been an increased improvement since about 1900. There is no sign of levelling off in recent years, so there is ample prospect of futher improvement in the next ten years.

According to the steeper section of the chart, man-hour requirements have been cut about in half every ten years. By 1970 we may therefore expect man-hour requirements to be half what they are today. Where will this improvement come from? One of the factors already beginning to appear is automatic design, where basic design specifications are conceived by the engineer, then fed into a computer that designs tne finished part to those specifications, and also programs the machine tool.

**The second qualitative trend is closer tolerances—or higher accuracy.** Wilkinson's boring machine broke the first barrier in 1775; prior to that it was not possible to bore a cylinder with out-of-roundness less than about ⅜ in. This barrier held up Watt's steam engine for several years. Then Wilkinson built the machine that, according to Watt's partner, was able to bore a cylinder true within the thickness of a worn shilling. Successive types of machine tools—Stowell's screw-cutting machine, Whitney's milling machine, and Fitch's turret lathe—improved on accuracy steadily, as still determined by feeler-gage measurement.

Well before 1900 this method of measurement reached its limit, but the inherent accuracy of the machines continued to improve. The invention of the micrometer in 1900 broke the measurement barrier; but since then the machine tool has al-

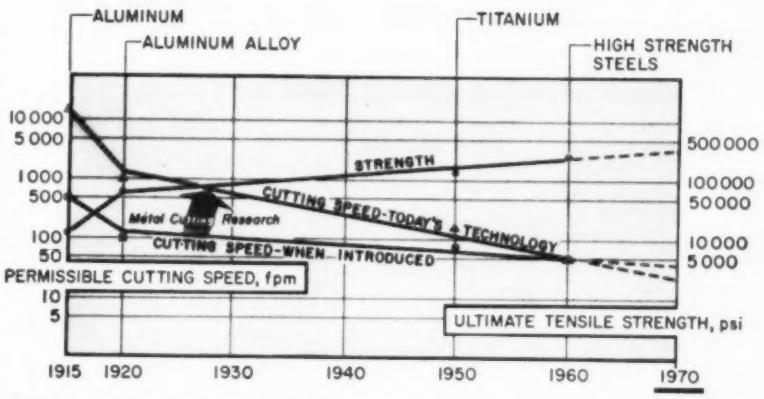
Based on a paper prepared for the Society of Automotive Engineers, National Aeronautic Meeting, New York, 1959.




**2—Accuracy increases . . .**
as machines and measurements improve. Trend is probably limited by size of atom

ways been able to machine to whatever accuracy can be measured by the finest means available at any date.

Improvements in accuracy also seem to have jumped since 1900, (chart 2) and in recent years we appear to have improved maximum accuracy by a factor of ten every ten years. While this curve shows no sign of levelling off, there is a strong physical limitation ahead—namely, the size of the atom. This corresponds roughly to 0.000,000,01 in., which is being approached rapidly. Whether we can go beyond this point in machining is highly doubtful, so we may be approaching a limit. However, it seems unlikely that a hundred millionth of an inch, as a limit to machining accuracy, will be a practical detriment to future manufacturing.

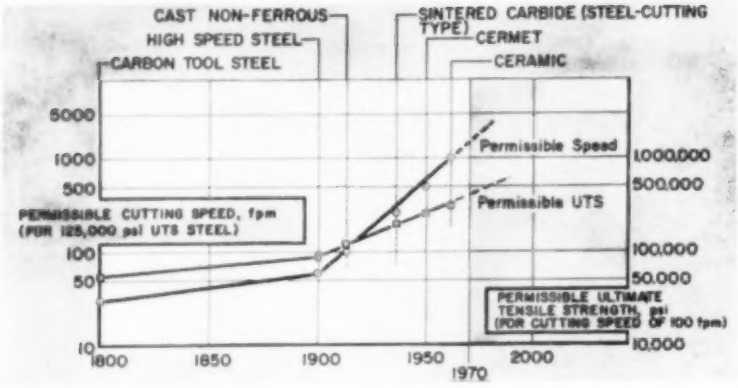



**3—Productivity is measured . . .**
by cutting speed on airframe materials. Cutting speeds are measured at left; strength of materials at right side of chart

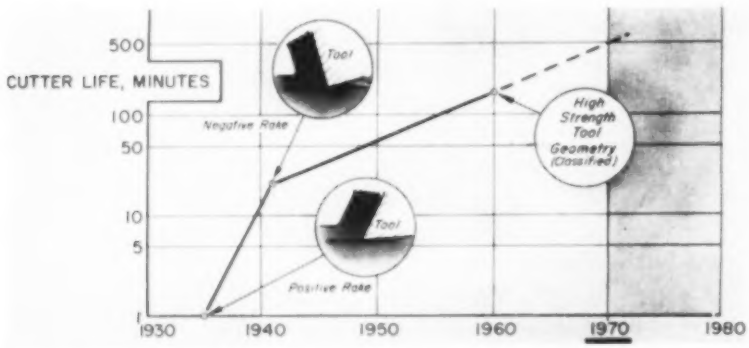
**The third qualitative requirement is improved productivity** in the face of rising strength in work materials. Improvements here must be in the region of the tooling. Strengths of airframe materials (chart 3) have increased at an exponential rate, and since 1920 the strengths have increased by a factor of 4. This has only decreased the permissible cutting speed by a factor of 2 over the same period, as seen on the lower curve in the chart. The lower curve shows the cutting speed possible at the time each of the new materials was introduced. The upper curve indicates permissible cutting speed for those same materials today.

If we extrapolate the upper curve into the next ten years, it would seem that cutting speeds would drop by a factor of two, assuming no improvement in machining technology. But extending the lower curve—cutting speed when new materials was introduced—indicates that cutting speeds may decrease at a slower rate, assuming improvements in machining technology. Only if this curve can be turned up in the next ten years can productivity on airframe parts be expected to improve.

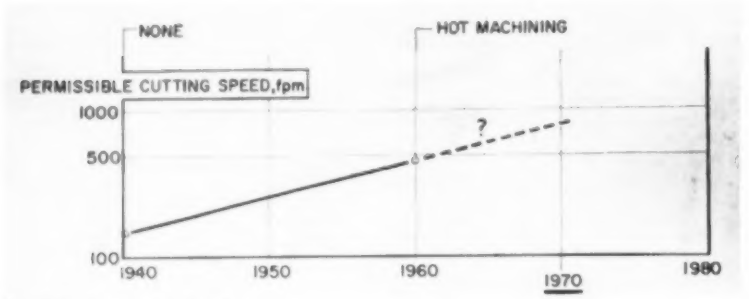
This means that metal-cutting research must be strengthened. The curves show that stock removal needs research now—a concerted effort of




**4—Tool materials improve . . .**
with steep upward trends, indicating that this is an area of high potential for improved machining efficiency




**5—Better tool geometry . . .**
is shown for carbide cutters milling 200,000-psi (ultimate) steel at 280 fpm




**6—Treating the work . . .**
includes hot machining, applied here to a 200,000-psi (ultimate) steel. Local heating makes tools work easier

scientific and engineering skills to meet the rising challenge.

### Cutting-tool improvements

Tool materials have advanced rapidly over the past 60 years; since 1900 the permissible cutting speed has doubled about every ten years (chart 4). This is a faster rate of improvement than for permissible utimate tensile strength of the work material, and it represents the area in which most future improvement may be expected. However, the most recent data for the curve comes from experimental setups with ideal vibration-free and minimum-impact conditions. Brittleness of the tool material may become a limiting factor, and futher research must concentrate on this point.

Another area for cutting-tool improvement is geometry, which has been recognized as important only in recent years (chart 5). When carbides were first introduced, their lives were short because of conventional positive rake . . . . which caused chipping. Negative rake for carbides introduced the first major advance. Further attention to tool geometry has produced additional improvement, as indicated by the third point on the curve. This point represents laboratory work that is, at the moment, classified. But there is a total of only three points on the curve, which means that interpretations can only be made from a crude set of data. The curve indicates that cutter life has been tripled about every ten years, which indicates that tool geometry is potentially a center for future improvements.

### Work improvements

Properties of the work material can be modified during machining —a relatively new concept that includes hot machining (chart 6). But there are only two points on the curve, which makes it a slim basis for extrapolating future trends.

Hot machining consists of locally heating the work material just ahead of the cutting tool—as with an induction heater. This makes the work material much weaker than it would normally be—and it has already allowed triple the cutting speed possible before. If improvements can continue at this rate, it might be possible to double the cutting speed in the next ten years. The question is whether or not there are other new techniques for modifying the properties of the work materials which will make future developments possible. Are high-frequency vibration, shock waves, and other ideas being explored?

Another possibility for future improvements in metal-cutting efficiency is ultra-high cutting speed, far beyond the range of any currently practiced or attempted. This also applies to feed rates. Take, for example, the possibility of cutting speeds beyond today's limit, around 15,000 fpm. (chart 7). The curve indicates that tool life continues to decrease with increased cutting speed. But is it possible that the curve might reverse itself, as indictated by the dotted line? Or can the curve be moved?

This is a question of long standing, and one that is hoped to be answered by a program undertaken by the Air Force, Lockheed Aircraft, and others. There is no previous experience that

can be applied as a guide, so what happens in the neighborhood of 100,000 fpm. can only be found by experiment. After this information is available, there may be an answer to the question of what will be expected by 1970.

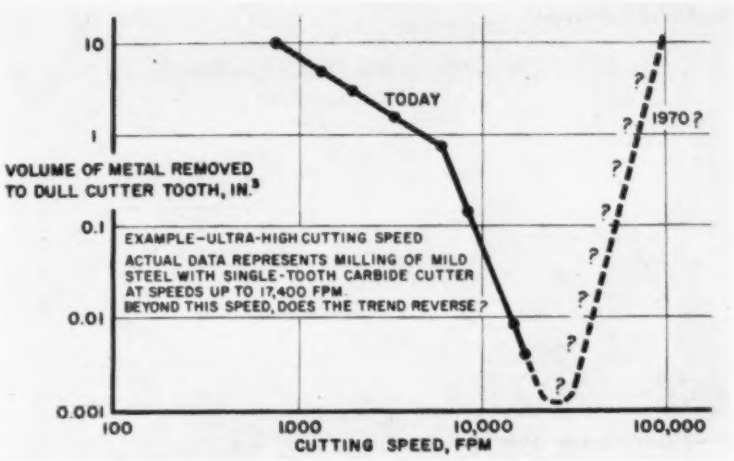
Cutting aids, such as cutting fluids, may provide new possibilities. The rate of improvement as cutting fluids are developed has been exponential since 1900 (chart 8). However, the improvement has only been around 20% each ten years, so this area shows the least potential of any we have examined so far.

As with improvements for single-point cutting tools, grinding improvements have risen sharply over the years. The rate of improvement has been only 40% each ten years, but there is no sign of levelling off (chart 9). Metal-removal rates for grinding are gradually approaching those for conventional cutting tools. It seems possible that in years ahead grinding may become less specialized and more applied for general machining. This would make necessary more versatile machines for grinding operations. Grinding may drift into stock-removing operations that are now handled by milling and turning, as well as others.

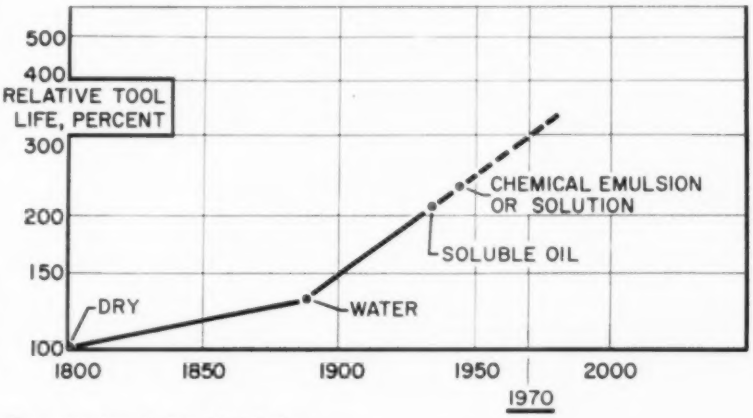
### New methods

A number of new methods for removing stock have been developed in recent years, but they show no definite trend when taken together (chart 10). Chemical milling and electric-discharge machining actually show a decrease in rate of penetration over the rate for electrolytic grinding. But other features of the processes, such as ability to work high-strength materials, more than offset the low rate of penetration. However, the most recent development in the field, electro-chemical or electrolytic machining, shows significant improvement. This process may be viewed as either an electrical assist to chemical milling, or a simplification of electrolytic grinding. On this basis, the least improvement is fourfold in ten years. These methods must hold possibilities for at least as much improvement again over the next ten years, and perhaps far more.

Electron-beam machining is another new method. It concentrates a beam of high-energy electrons to vaporize metal at the point of impact with the work. The beam is pulsed to keep up the temperature gradient at the surface of the work. This limits damage to adjacent surfaces to a depth of about 50 millionths. At a power level of 100 KW, it can slice a slot through ⅛-in. stock at up to 60 ipm. The beam can cut slots from 0.001 to 0.040 in. wide ±0.0001 in., and can also trepan and contour cavities. Depth accuracy is to ±50 millionths.




**7—Unconventional machining . . .**
may improve metal removal, perhaps with a sudden increase in efficiency at cutting speeds past 15,000 fpm



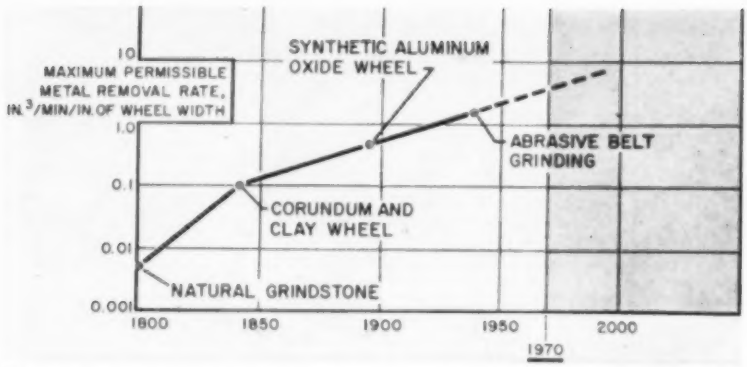

**8—Cutting fluids also help . . .**
by making tools last longer. However, improvement is only about 20% in ten years, so cutting-fluid potential is not high

Perhaps the most important aspect of electron-beam machining is its almost complete independence from the properties and nature of the work material; it will work high-strength metals almost as effectively as mild steel. Metal-removal rates are not high, but the method handles specialized work, and may be a forerunner of future specialized devices.

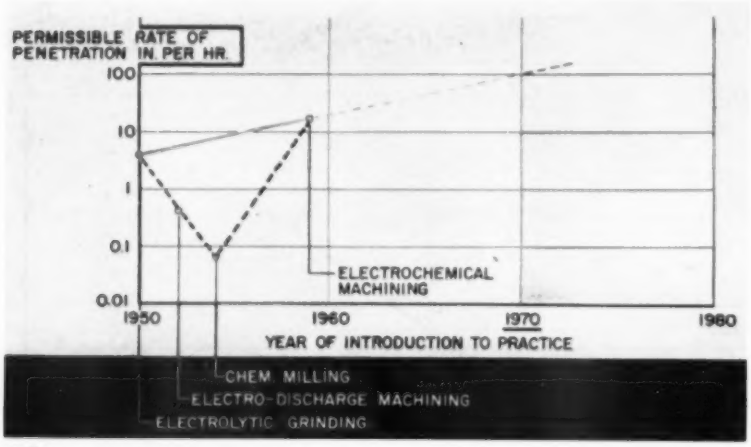
Another future possibility is the plasma jet, which constricts an electric arc (a cloud of ions and electrons) into a slender beam that has an extremely high temperature. The arc is surrounded by a cooling fluid (liquid or gas) that cools the outer regions of the arc, reduces their conductivity, and forces the current to flow in higher and higher concentration. At high speed, the ions in the central stream act as if they were in parallel conductors, and they tend to concentrate even more. The jet reaches temperatures of 15,000 to 30,000 F, which will vaporize even a ceramic surface almost instantly. It can knife through a metal plate in short order, and it has been reported that the method leaves a cleaner cut than flame cutting. This also may be the forerunner of a new type of machining process for 1970.

High-velocity liquid jet may also

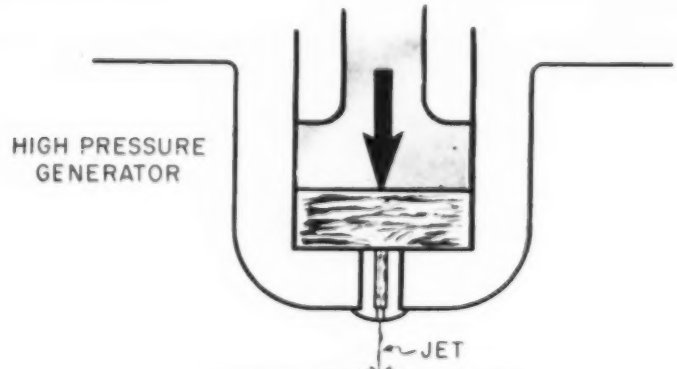
## 10 YEARS AHEAD...




**9—Grinding rate goes up . . .**
and appears to have no limit so far. Metal-removal rate is approaching the rate for cutting tools with blades




**10—New methods . . .**
show no definite trend, but they work on tougher, more brittle materials than conventional machining methods




**11—High-velocity liquid jet . . .**
may use plastic flow and erosion to cut metals. This idea may be the basis for a new kind of machine

be a new tool. It is known that raindrops will seriously erode the metal surface of a high-speed flight vehicle. This problem of rain damage has been studied by Engel of National Bureau of Standards and by Jenkins in England, as well as others. Recently Bowden and Brunton have demonstrated that 0.01-cc slugs of water fired at 3500 fps against high strength stainless steel will form pits by combined plastic flow and erosion. Can such a high-velocity jet be applied to knife through metal? The principle of vaporblast might be extended, with abrasive added to the jet to increase the rate of metal removal.

### Future possibilities

It is evident that machining problems are increasing at a sharp rate, but improvements in technique have also been increasing rapidly. In most cases there is no sign of levelling off; and a composite of all these trends indicates roughly a doubling of effectiveness each ten years. But even this seems hardly sufficient for the future. It would appear that progress in metal removal has been easy in the past; the future will not be so easy. Large-scale well-organized planned technical research will be necessary.

### Bibliography


"*Symposium on Tools*", *Centennial of Engineering, Sept. '52 (The Cincinnati Milling Machine Co.)*

"*Gauges and Fine Measurements*", *F H Rolt (Macmillan & Co. '29)*

"*Development of Machine Tools in New England*", *Guy Hubbard (American Machinist, '23-24)*

"*The Coming of the Machine Tool Age—The Tool Builders of Cincinnati*", *F V Geier (Princeton University Press '49)*

"*Manual on Cutting Metals with Single Point Tools*", *Research Committee on Metal Cutting Data and Bibliography (ASME '52)*

"*Tool Engineers Handbook*" *(McGraw-Hill '49)*

"*A Treatise on Milling and Milling Machines*" *(The Cincinnati Milling Machine Co. '51)*

"*Drilling by Electrons*", *K H Steigerwald, U S Patent 2,793,281 (May 21 '57)*

"*The Plasma Jet*", *G M Giannini, Scientific American, Vol 197, No. 2, p 80-88 (Aug '57)*

"*Damage to Solids by Liquid Impact at Supersonic Speeds*", *F P Bowden & J H Brunton, Nature, Vol 181, p 873-875 ('58).*

American Machinist

May 18, 1959

## Simplified method teaches

# SKETCHING FOR EVERYONE

**NO NEED TO BE AN ARTIST!**

Get your ideas across **QUICKLY AND ACCURATELY** with simple, natural looking sketches. Only **A PENCIL AND A LITTLE PRACTICE** permits orthographic, perspective, cut-away, exploded-assembly and even shop lay-out drawings. Method uses the **NATURAL TREMBLE** that makes many people believe they can't draw.

Jerome J. Fider Jr.
RIVER EDGE, NEW JERSEY

1.

2.

3. Slowly, draw a wiggly line ~~~~~
**EXAGGERATE** the waves in your line at first

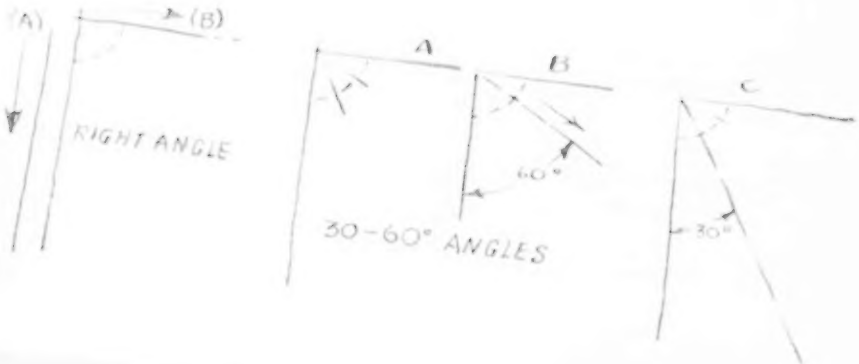
4. Leave short breaks, and **LOOK BACK** at the line
Focus here.

5. Draw horizontal lines from **LEFT TO RIGHT** →

6. Draw vertical lines **DOWNWARD** ↓

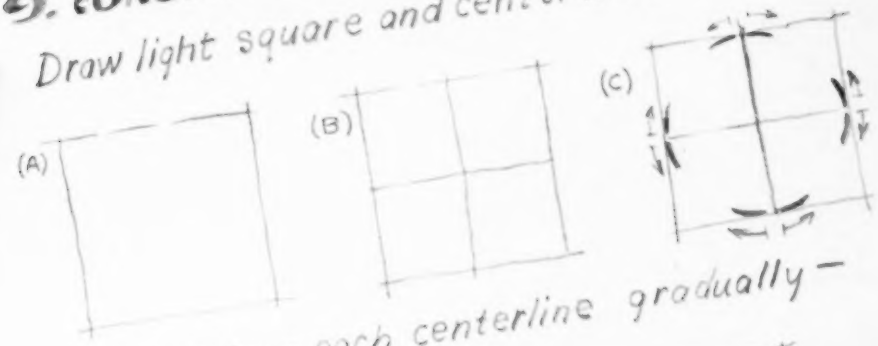
7. Draw sloping lines from **UPPER LEFT - DOWN** ↘

8. **ANGLES** -

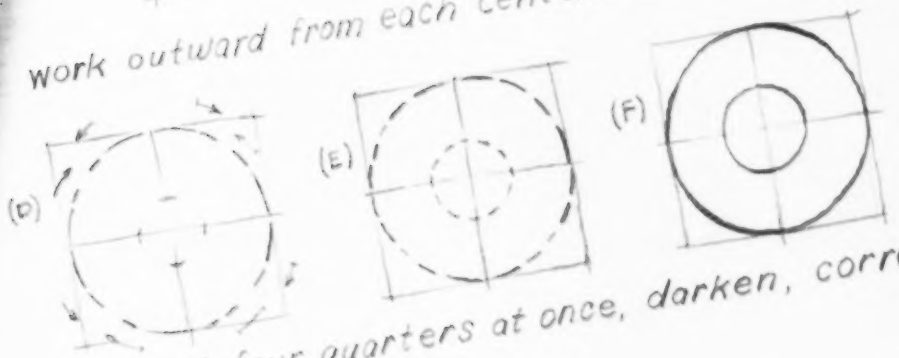


## 9. CONSTRUCTING CIRCLES —

Draw light square and center lines



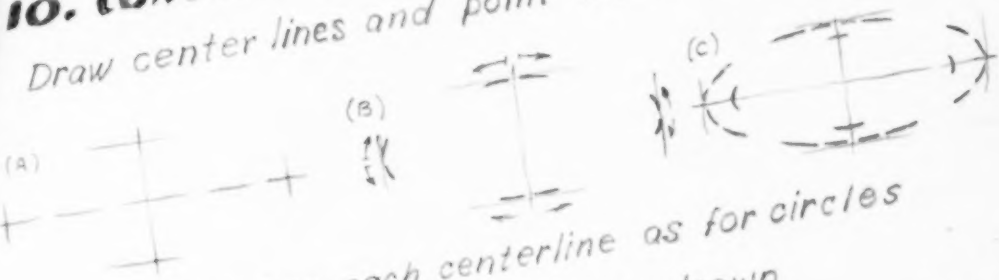

Work outward from each centerline gradually —



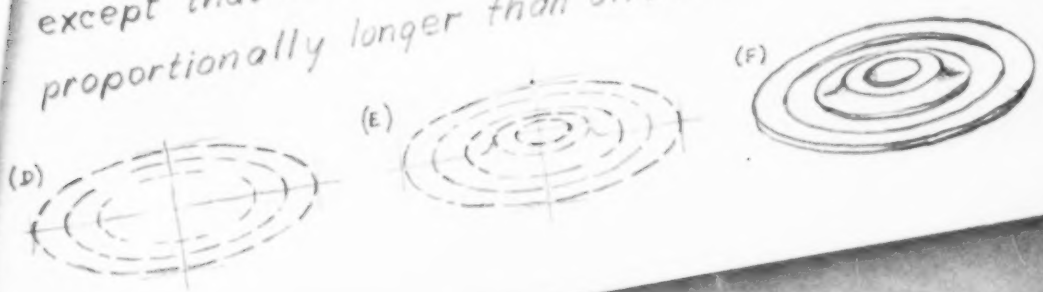

complete all four quarters at once, darken, correct.

## 10. CONSTRUCTING OVALS —

Draw center lines and point off dimensions

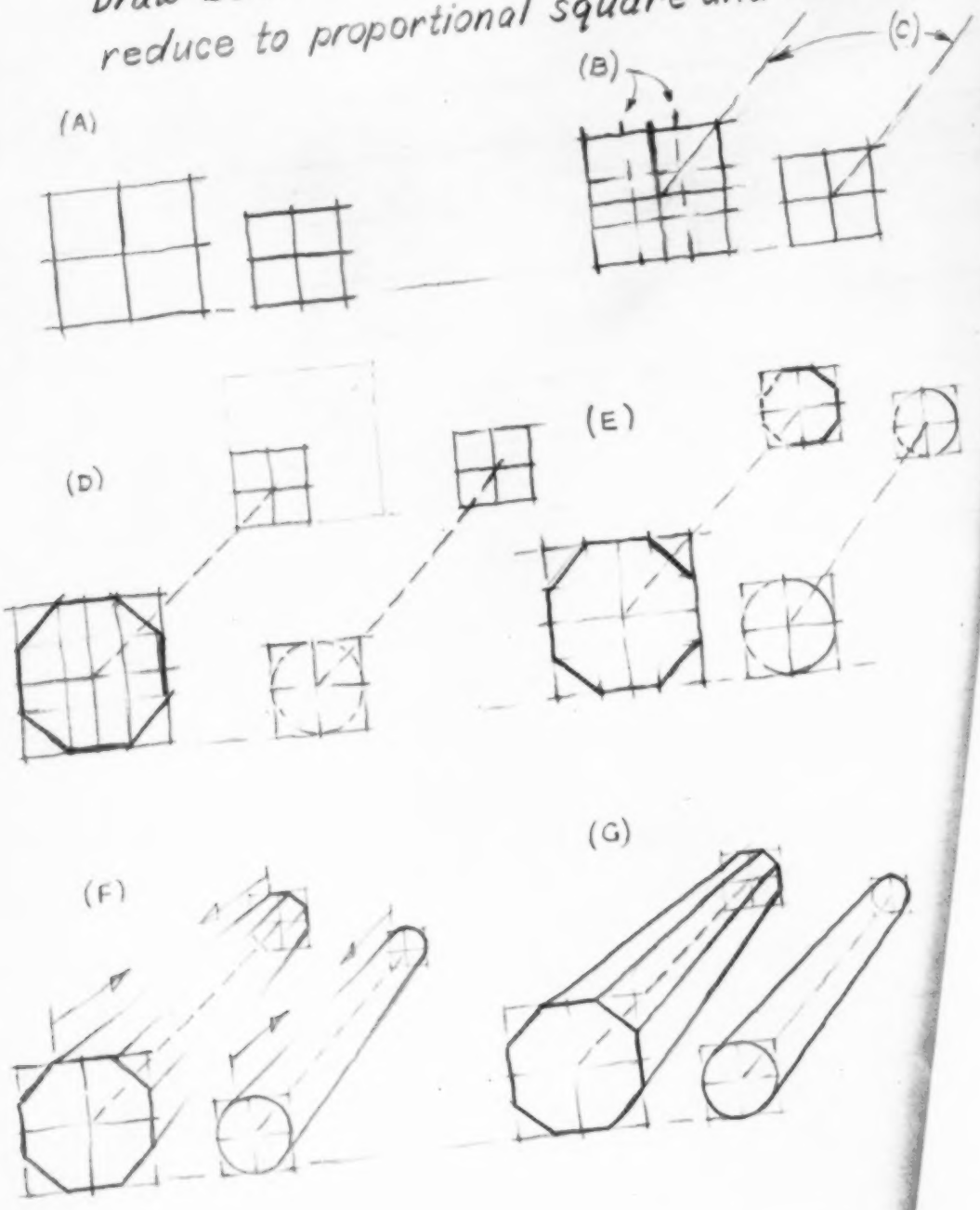



Draw outward from each centerline as for circles except that lines on long sides are drawn proportionally longer than on short sides, each time.

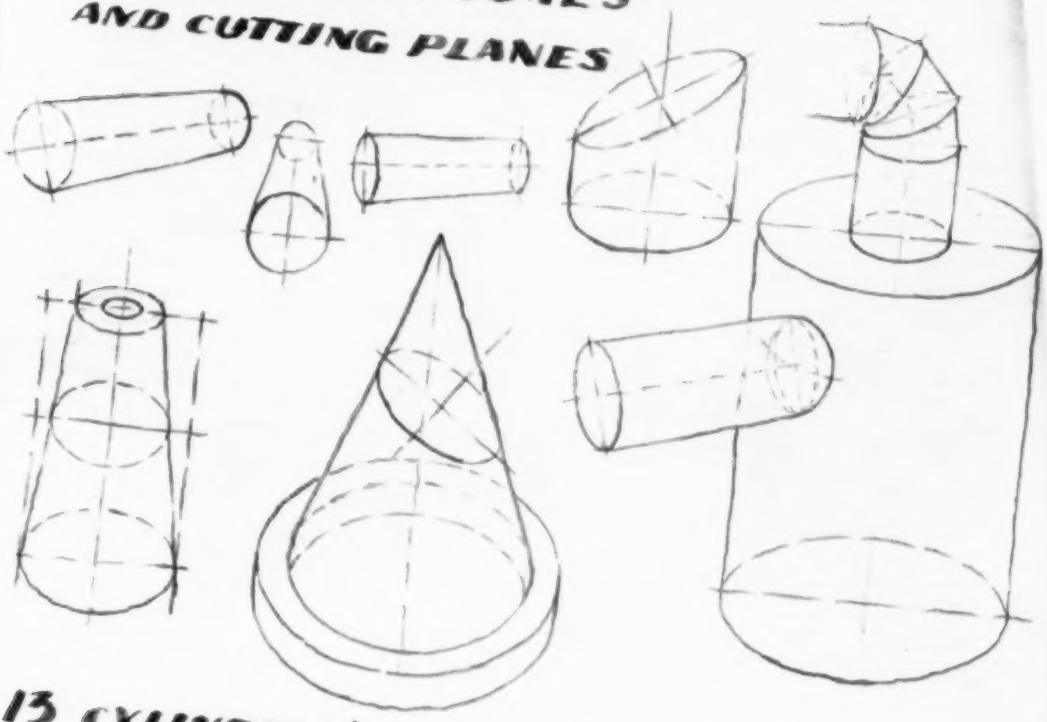


## II. HEX AND CYLINDER —

Simple perspective like this can be drawn without a vanishing point. Draw back end same size as front, then reduce to proportional square and connect.

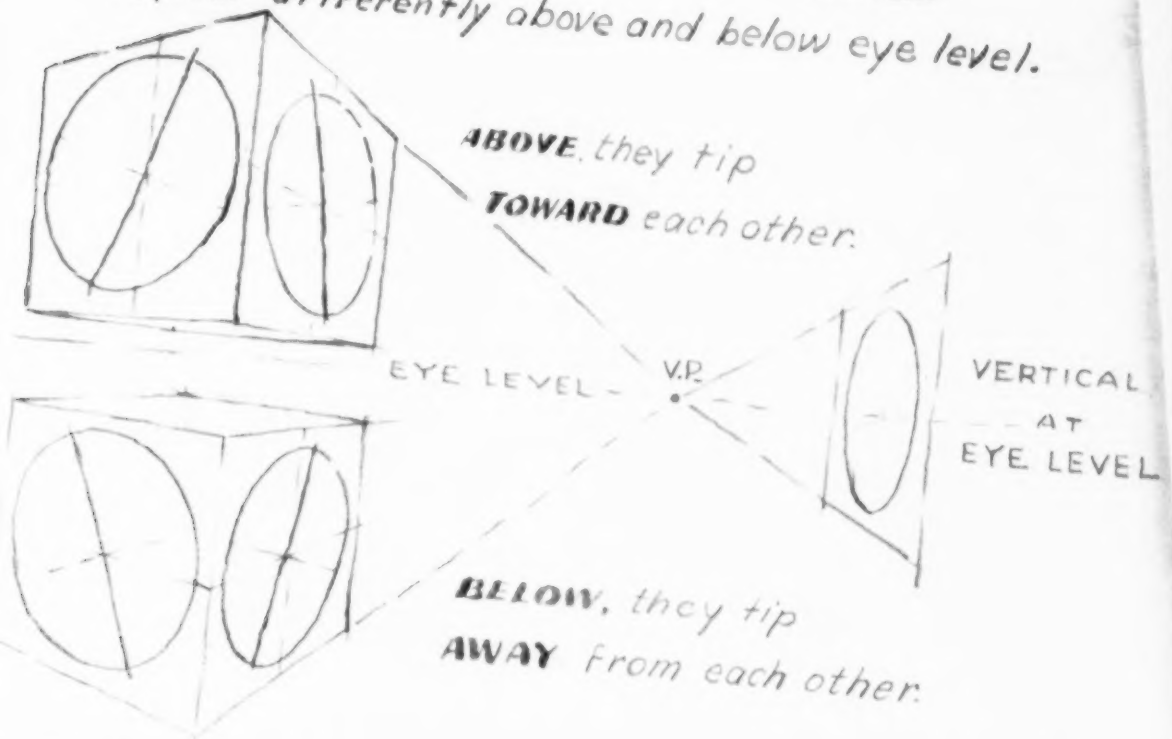


## 12. CYLINDERS, CONES AND CUTTING PLANES

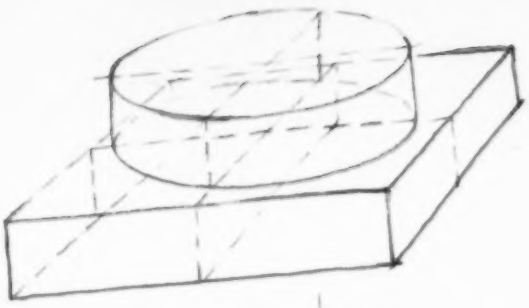


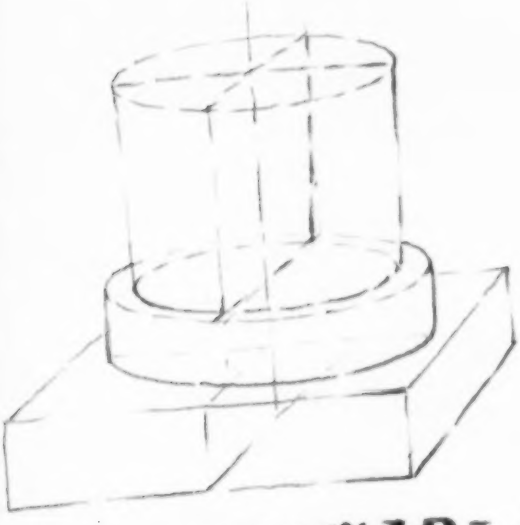
## 13 CYLINDERS' INTERSECTING PLANES

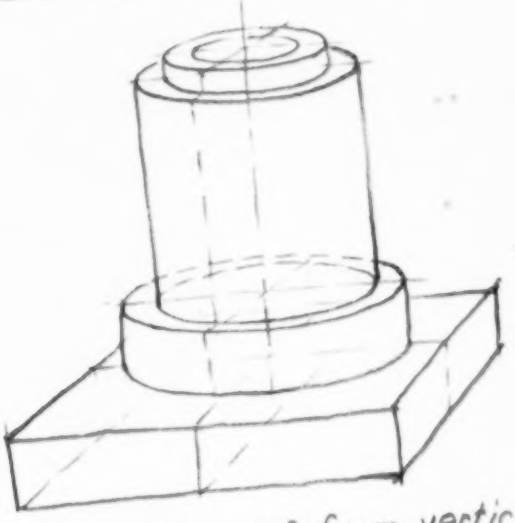
Appear differently above and below eye level.



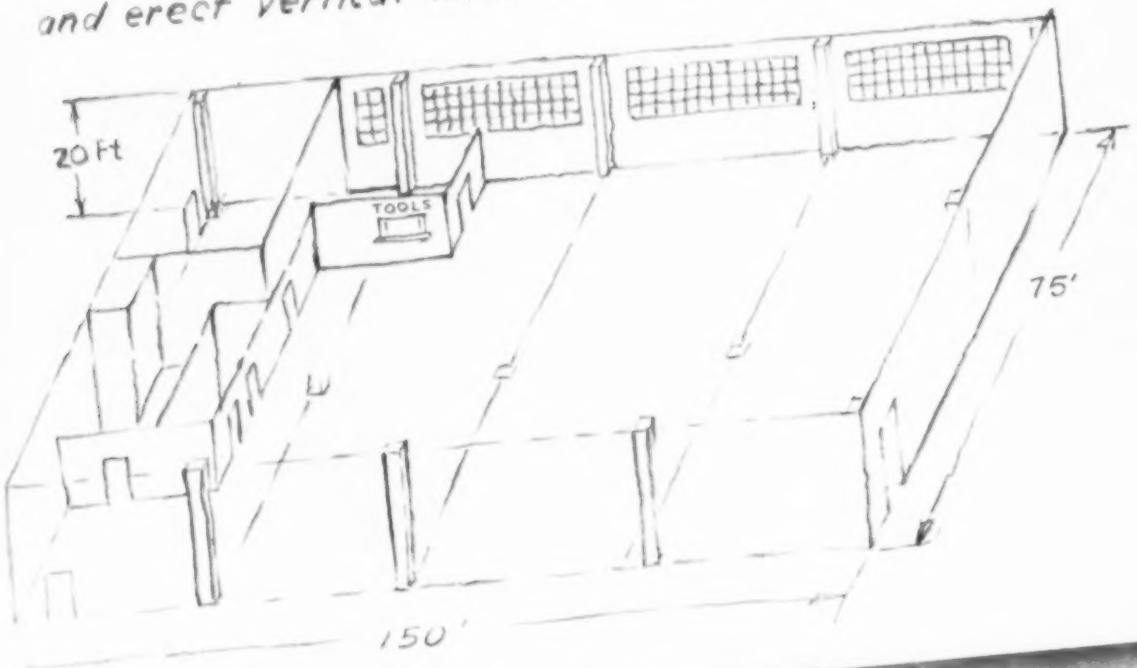
**4. ASSEMBLIES —** low same procedure for
-ups and horizontal subjects







**15. SHOP PLAN IN 3D –** Slope floor lines 30° from vertical and erect vertical lines for wall, posts, etc.




**Reprints** of this article are available at 25¢ each. Prices are reduced for quantities over 100. Order from Reader Service Dept., American Machinist, 330 W. 42nd St., New York 36, N. Y.

## *Speed up*

# and CLINCHING

### Automatic feeding and setting with T-J

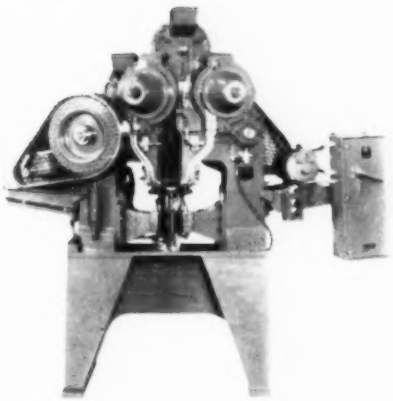
You'll realize *faster assembly . . reduced labor costs* immediately, when you use T-J Rivitors and Clinchors for your production line. These performance-proved machines are designed to do a wide range of assembly jobs for aircraft, automotive, farm machinery—riveting jobs of *all* kinds.

T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to ⅞" long. Throat depths 8" to 36".

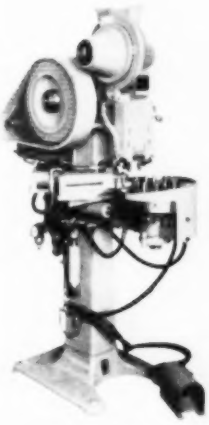
T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity Feed models, throat depths 8" to 36".

Send today for these helpful references: Rivitor bulletins 646 and 555 . . . Clinchor bulletin 555. The Tomkins-Johnson Co., Jackson, Mich.

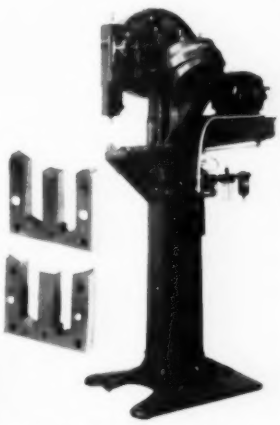
T-J TOMKINS-JOHNSON
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS



**RIVETS 4 AT A TIME!** Special quadruple riveting unit, incorporating two Model "RR" Twin Rivitors, mounted on a special welded steel base. Equipped with air-operated hold down mechanism and a safety air trip arrangement. Tooled for riveting left hand and right hand automotive muffler bracket assemblies.



**SPECIAL TWIN RIVITOR!** Tooled for 6 station indexing fixture, incorporating automatic clamping and ejecting mechanisms, for riveting laminated armature assemblies.



**T-J CLINCHOR** adapted to a wide range of clinch nut setting problems. Gravity Feed model shown here.

# If you have a tough application for a bronze metal Johnson's ALUMINUM BRONZE bars are the answer

Quality **Johnson Aluminum Bronze Bars** are ideal for giving trouble-free performance in such applications as gears, worms and worm wheels, valve seats and guides, hydraulic valve parts, plungers, pump rods, guide pin bushings, special bearings and many others.

Compact grain structure and the unusual alloy in these bars result in high physical properties that increase service life and cut down-time to the minimum.

Resistance to wear and fatigue? Exceptional. Inclusions, porosity, undersurface defects? None.

Johnson's quality solid aluminum bronze bars are supplied with extruded finish. Centrifugally cast tubular bars are semi-finished and machined on the ID and OD. *Both* bars are supplied in standard 12½-inch lengths and in 97 sizes up to 8-inch OD. This allows for saw cut, in equal divisible lengths, with almost no loss in metal.

All 97 sizes regularly carried in stock for both solid and tubular bars assures immediate delivery. Write for catalog. Or, better yet, contact your Johnson distributor. He will be happy to provide more information and quick service.

## Johnson Bronze

515 South Mill Street • New Castle, Pa.

Subsidiary, Apex Bronze Foundry Co., Oakland, Cal.

JOHNSON Bearings

GRAPHITED
over 175 sizes

STANDARD STOCK
over 900 sizes

UNIVERSAL BRONZE BARS
over 400 sizes

POWDER METALLURGY
over 400 sizes

ELECTRIC MOTOR
over 350 sizes

American Machinist

REFERENCE BOOK SHEET

# Permanent Mold Aluminum Castings—I

By Peter Noy, planning engineer, Small Appliance Section, Canadian General Electric Company, Barrie, Ontario, Canada

Permanent-mold aluminum castings are produced from a variety of aluminum alloys. They are made by pouring molten alloy into a metal mold—either book shaped or in two parts.

The inside of the mold is coated with a "wash" which is a slurry of clay, graphite, whiting, or other refractory earth in a sodium-silicate binder. The wash is sprayed while the mold is hot and is allowed to cake. The insulating coat affects the way the metal pours and solidifies, protects the surface.

As a process, and also according to the properties of the casting, permanent-mold casting stands between sand casting and pressure die casting. Several tables compare costs, production and properties.

## Alloys Used

The alloys preferred for permanent molding are mostly in the silicon group. The presence of iron in these alloys is kept below certain low limits because it has a bad effect on casting properties. In addition, this silicon group is generally low in copper to avoid the active copper-aluminum couple and thus avoid corrosion.

For applications where strength at high temperatures, wear resistance and hardness with retention of machinability are needed, the copper group may be recommended. This is true even though this group is more prone to corrosion and may shrink more in casting.

Heat treating may bring out superior corrosion resistance, mechanical strength, ductility, or stability with some alloys.

Solution heat treatment keeps the casting at a temperature near its melting point for a period of time in order to allow the alloying ingredients, which were largely deposited along the grain boundaries when cast, to dissolve throughout the metal. When quenched, the result is a supersaturated solid solution.

However, such a solid solution is unstable. Crystallization tends to occur, which causes growth. In order to stop this, the casting is usually aged.

Aging is either done naturally, or speeded up by holding the casting at moderately high temperatures until precipitation occurs. This results in a more ductile product than as cast, and a stable one.

**See page 157 for design hints for permanent-mold castings.**

## Production Rates and Costs

| | Sand Castings | Perm. Mold Castings | Die Castings |
|---|---|---|---|
| Mold cost | $300 | $2000 | $5000 |
| Production | 10-15 hr. | 40-60 hr. | 120-150 hr. |
| Scrap loss | High | Medium | Low |

**These figures apply to a casting of about 3 lb weight, of a moderate degree of complexity.**

## Comparative Quality of Castings

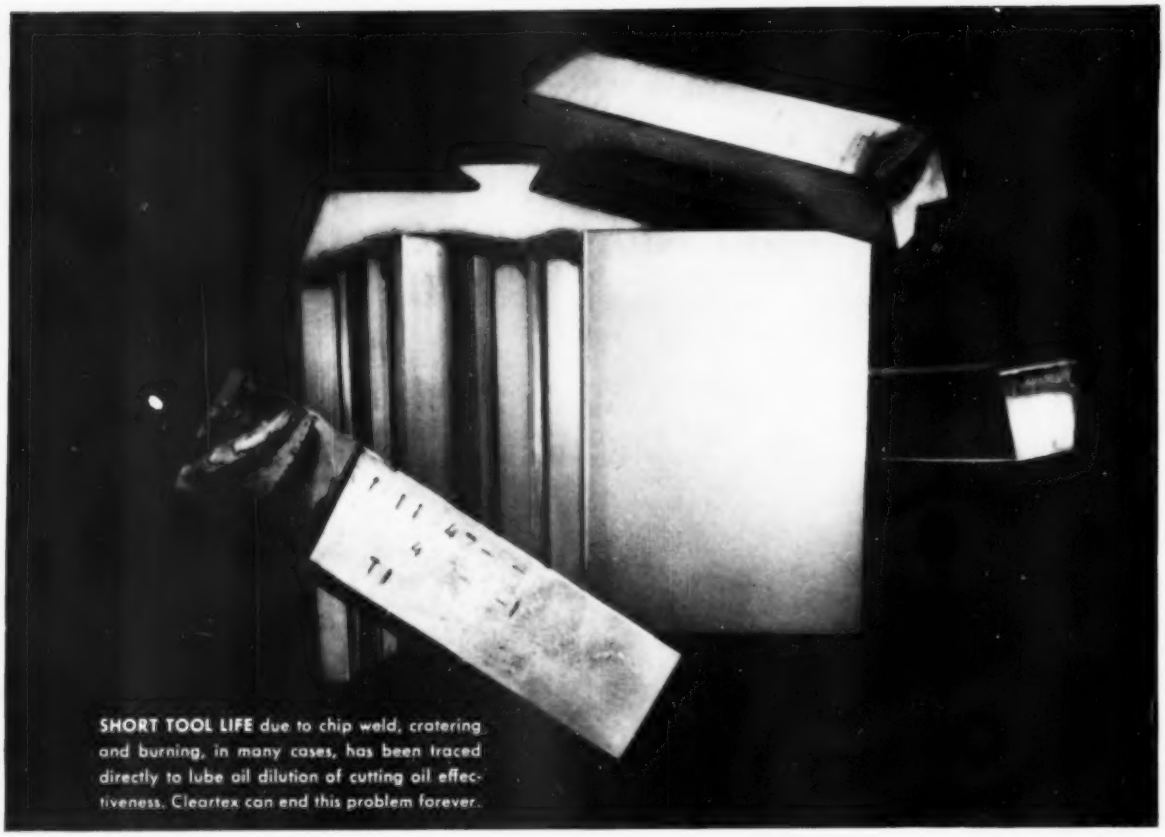
| | Sand | Perm. Mold | Die-Cast |
|---|---|---|---|
| Minimum section thickness, in. | 1/4 | 1/8 | 1/16 |
| Surface finish | Rough | Medium | Smooth |
| Tensile strength, (ult.), psi | 19000 | 23000 | 28000 |
| Tolerance, first inch | 1/16 | 1/64 | 0.006 |
| Porosity | High | Low | Medium |

## Mechanical Properties

| No. 43-F Alloy* | Sand Cast | Permanent Mold |
|---|---|---|
| Ult tensile, psi | 19000 | 23000 |
| Yield strength, psi | 8000 | 9000 |
| Shear strength, psi | 14000 | 16000 |

| No. 13 Alloy* | Perm. Mold | Die-Cast |
|---|---|---|
| Ult. tensile str, psi | 30000 | 39000 |
| Yield strength, psi | 15000 | 21000 |
| Shear strength, psi | — | 25000 |

*Aluminum Co of America



**SHORT TOOL LIFE** due to chip weld, cratering and burning, in many cases, has been traced directly to lube oil dilution of cutting oil effectiveness. Cleartex can end this problem forever.

# Diluted cutting oil shortens tool life drastically

Lubricating oil is probably leaking into the cutting oil sumps of your automatic screw machines as you read this. Current research proves that this is happening in 70% of all the automatics in use today! And where it happens, it shortens tool life by as much as 50%—even 70%. On top of this, the cost of extra regrinds, lost production during tool changes, and excessive scrap production is putting a premium on screw machine operation in too many shops.

**Look for these symptoms.** One sure sign of dilution is the need for frequent refilling of the lube oil sump. If you are using an ordinary lube oil, this dilution will create two additional—and more costly—symptoms: excessive scrap production and frequent regrinds. Now you can eliminate these forever with the

**TEXACO CLEARTEX CURE**

The exceptional chemical stability and load-carrying ability of Texaco's Cleartex series make them equally suitable for use as cutting oils, lubricants or hydraulic fluids. All you have to do is use them for both cutting *and* lubrication. With Cleartex in *all* your sumps, you'll find cutting oil dilution will stop and screw machine production cost will drop substantially.

**Write today for your copy** of Texaco's helpful new booklet "Cleartex in Automatic Screw Machines"...and contact your local Texaco Lubrication Engineer for an authoritative survey of your automatics. Just call the nearest of the more than 2,000 Texaco Distributing Plants, or write Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. 1A-FM-20.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

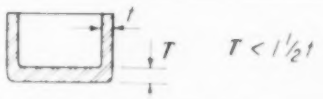
# Permanent Mold Aluminum Castings—II

## Design Hints for Permanent-Mold Castings

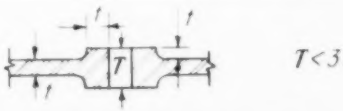
**1.** Consult a qualified and experienced designer of permanent molds about your castings. Designing these molds is an art. The castability of your design can be predicted by him.

**2.** Keep the parting line in mind, and keep it straight. A complicated parting line is sure trouble.

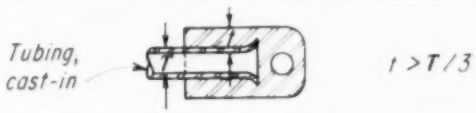
**3.** Keep section thicknesses as nearly uniform as possible.



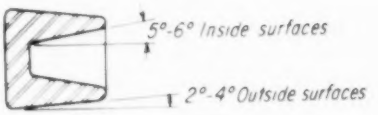

**4.** Make isolated bosses and other such features as light as possible.



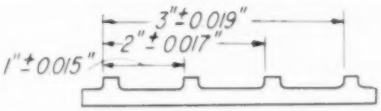

**5.** Where inserts are to be cast in, allow adequate metal around them. Because the insert tends to cool the metal, there is a danger of cold shuts and shrinks.




**6.** Allow draft. Adequate draft is 2°-4° on outer surfaces; 5°-6° on inner surfaces. Metal will shrink from the outer surfaces and crowd the inner ones.

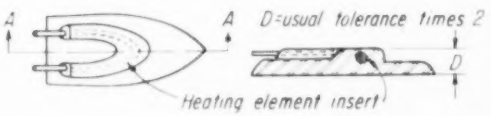



**7.** Tolerances (rule-of-thumb) are: first inch or less: ± 1/64 in. Add ±0.002 in. to each additional inch

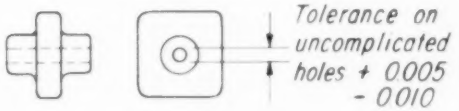



**8.** If the dimensions are over a parting line, add an additional ±1/64 in.

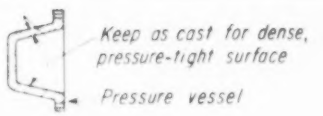
**9.** Dimensions over inserts can not easily be predicted; so double the ordinary tolerances.

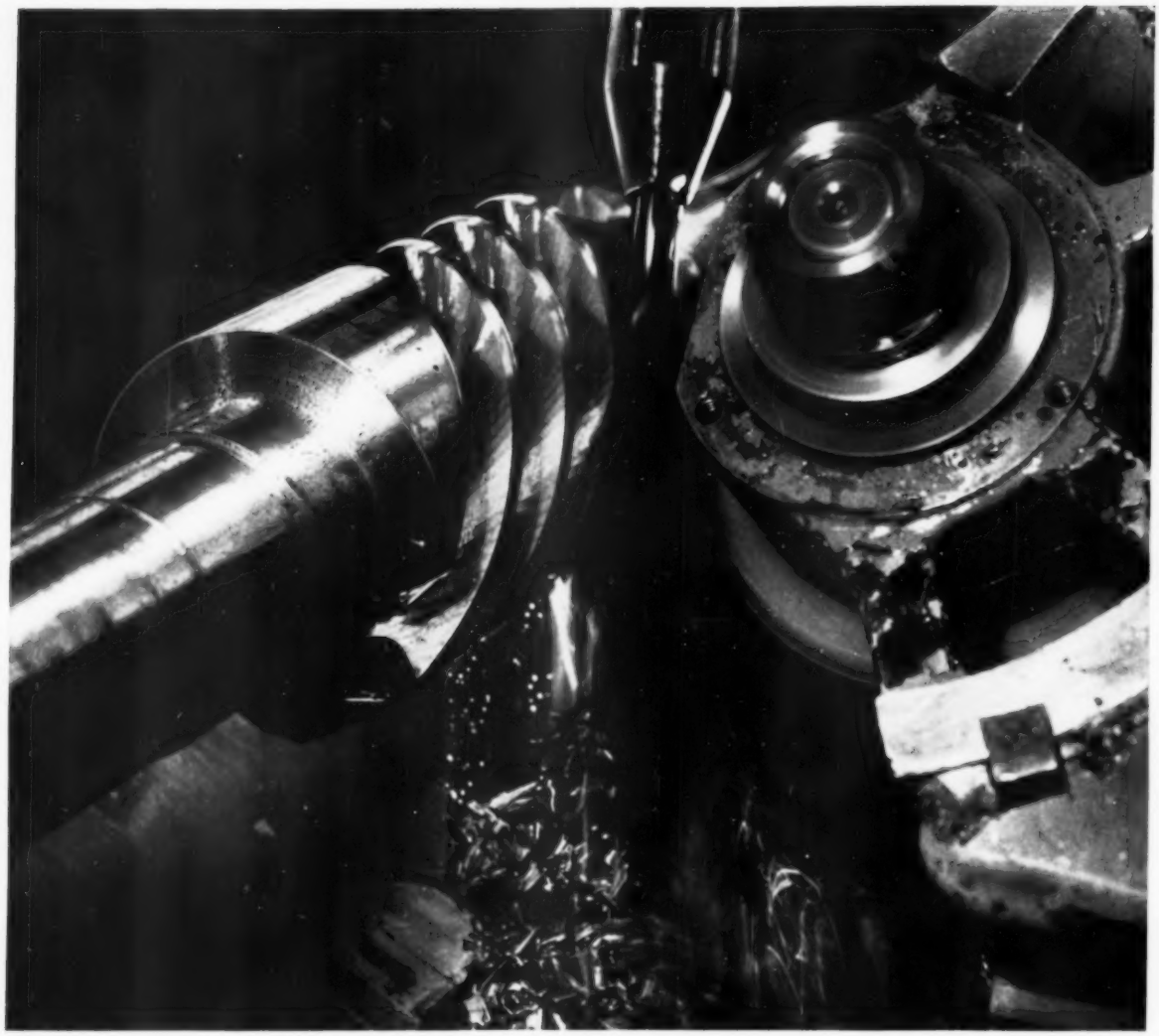



**10.** Holes can be held to + 0.005-in.—0.010 in., unless they are complicated by any of the above factors.




**11.** If a pressure or liquid-tight casting is desired, remember that the 1/32 in. of chilled metal next to the mold is dense. Do not remove it by machining.





# Aristoloy leaded user reports 25% reduction in time required to cut worm gear threads

Cutting threads on worm gears is an expensive, time consuming operation. Geometry is critical and a considerable amount of metal must be removed. One of the large manufacturers of "worms," desiring to increase production, found that by switching to a *leaded* steel* he could increase both speeds and feeds. Equally important, expensive cutting tools lasted longer because of the freer machining characteristics of leaded steel—delivering more pieces between grinds, and drastically reducing down-time for tool changes.

Strength and hardness tests on the finished part, after heat treating, indicated no detectable difference in physical properties from unleaded grades previously used.

For complete information about Aristoloy leaded or standard analyses carbon, alloy, and stainless grades, write for booklet entitled, "A Complete Line of Leaded Steels," and new Products & Facilities Catalog. *Inland Ledloy License

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4009 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

# Application of Carbide Reamers

By Carl Neiderfringer, president, The Atrax Co, Newington, Conn

## The following recommendations apply to use of solid-carbide reamers:

**For Longer Tool Life**

1. Elimination of chatter will protect cutting edges, insure better hole finish.
2. To eliminate chatter, reduce rpm.
3. If reduced rpm does not eliminate chatter, increase feed as rpm is reduced.
4. Carbide bushings are recommended. In cases where bushings are necessary they should fit reamer closely (approx. 0.0002) with just enough clearance to avoid freezing.
5. Use power feeds on all materials up to Rockwell C-55.
6. Use hand feed on materials harder than Rockwell C-55.
7. Be sure workpiece is firmly held.
8. Be sure spindle is in excellent condition.
9. Never stop reamer while engaged in cut.
10. Handle, store, or ship reamer with care.

**Stock Removal**

Stock left in hole before reaming must be sufficient to engage reamer properly. Too little stock will cause excessive reamer wear, too much stock can cause a chip problem resulting in reamer freezing or breaking.

**Hole Finish**

Solid-carbide reamers, when used properly, produce superior hole finishes, especially in tough materials such as hardened steels up to Rockwell C-60. Excellent finishes can also be produced in aluminum, brass, bronze, stainless, etc.

**Hole Accuracy**

Solid-carbide reamers, like other solid-carbide tools, because of their hardness, hold precise tolerances many times longer than comparable high-speed-steel tools in any material.

**Maintenance**

When resharpening, use 320-grit or finer diamond wheel of resinoid-bond type.

**Reamer Rake Angles**

Most reamers are supplied with a radial to one degree positive rake. Unless materials to be reamed require special rake angles, standard reamers with radial rake will work well.

Steel sometimes requires a shear cutting action. This is obtained by using a radial-rake reamer having right-hand spiral flutes.

Left-hand spiral reamers have a negative shear cutting action at the lead or cutting chamfer.

**Reamer Back Taper**

The back taper of a reamer is generally 0.0002 to 0.0003 per in. on chucking reamers and 0.0008 to 0.0010 on rose-type reamers, which have no other relief on the diameter.

**Odd-Fluted Reamer**

Odd-fluted reamers offer advantages where extremely fine finishes and close-tolerance, round holes must be produced. Special construction eliminates opposing flutes and incorporates unequal spacing of flutes.

**Spiral Flutes**

Right-hand spiral flutes produce better finishes in certain materials, because of shearing action on lead end. In some materials, however, where a negative shear is desired, a left-hand spiral will obtain better results.

**Taper Holes**

Again, a rigid setup and good spindle are necessary. A minimum amount of stock, sufficient to clean up, should be left in the hole. If a relatively large amount of stock must be removed, use a straight-fluted reamer as a rougher, followed by a spiral-fluted finisher.

For close tolerance taper holes, semi-finish with standard spiral taper and finish with high-spiral reamer.

### Cutting Speeds

| MATERIAL | SFPM |
|---|---|
| Steel (All Types) | |
| Rockwell C 60 or harder | 8-20 |
| Rockwell C 50 to 60 | 15-30 |
| Rockwell C 40 to 50 | 20-40 |
| Rockwell C 30 to 40 | 35-65 |
| Under Rockwell C 30 | 60-90 |
| Cast iron and malleable iron | 50-85 |
| Non-Ferrous | |
| Aluminum | |
| Brass | |
| Bronze | |
| Copper | 90-175 |
| Fiber | |
| Plastic | |
| Hard Rubber, etc. | |

| FEEDS | IPR |
|---|---|
| Steels | |
| Rockwell C 50 or harder | 0.002-0.004 |
| Rockwell C 30 to 50 | 0.004-0.008 |
| Cast iron, malleable iron | 0.005-0.010 |
| Non-ferrous materials | 0.005-0.012 |

### Coolants Required

| MATERIAL | LUBRICANTS |
|---|---|
| Steel harder than Rockwell C 50 | Light oil |
| Steels softer than Rockwell C 50 | Light oil for good finishes or Soluble oil and water |
| Cast iron and malleable iron | Soluble oil and water |
| Non-ferrous materials | Soluble oil and water |

**NOTES:**

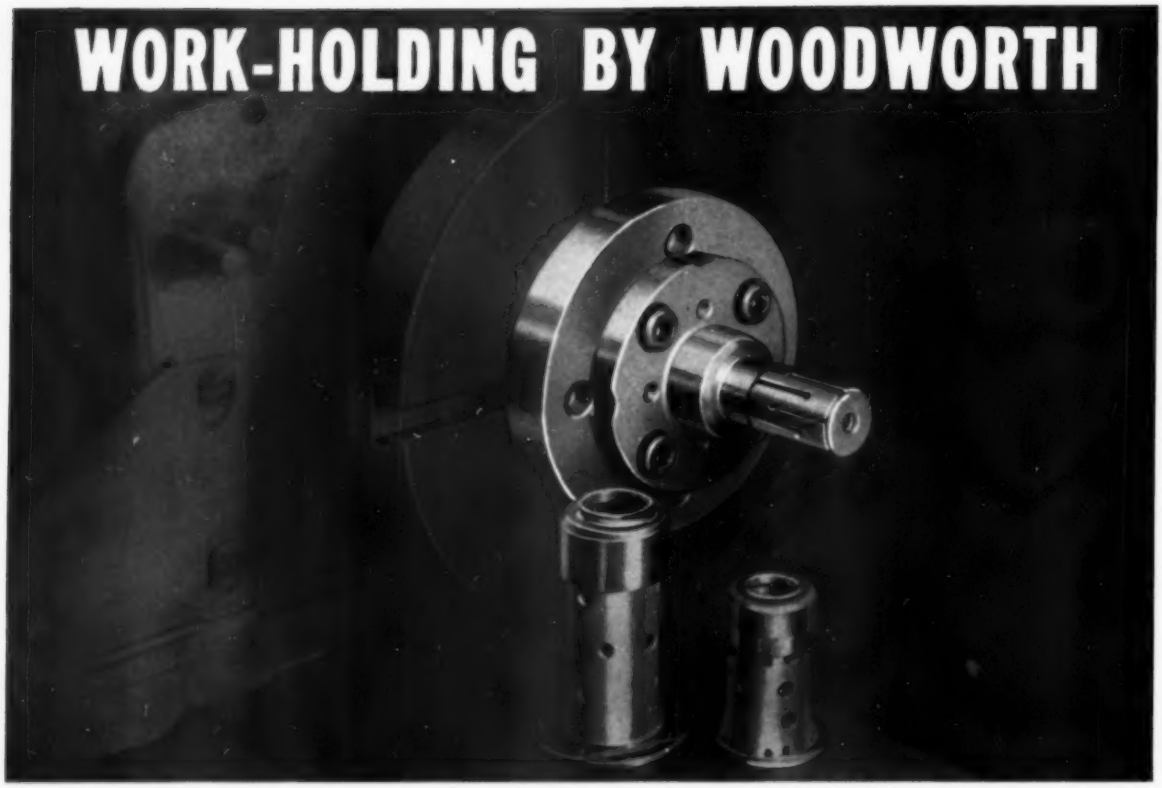
Use a heavy flow of lubricant for best reamer performance, especially on tough materials.

Kerosene gives superior finishes on many non-ferrous metals—aluminum, bronze, etc. Exercise caution with flammable lubricants.

### Stock Removal

| REAMER DIA | STOCK REMOVAL |
|---|---|
| Up to 1/16 Incl. | 0.003 to 0.005 |
| Over 1/16 to 1/8 " | 0.004 to 0.008 |
| " 1/8 to 1/4 " | 0.006 to 0.012 |
| " 1/4 to 3/8 " | 0.008 to 0.014 |
| " 3/8 to 1/2 " | 0.010 to 0.015 |
| " 1/2 to 3/4 " | 0.012 to 0.018 |

# WORK-HOLDING BY WOODWORTH

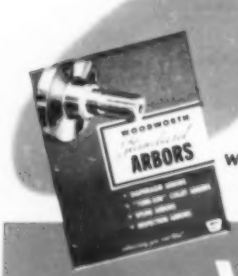


## WOODWORTH ARBOR ASSURES POSITIVE DRIVE IN CRITICAL AIRESEARCH OPERATION

TOM M. LAWTHERS

**TOM M. LAWTHERS**, General Supervisor of Production Engineering, AiResearch Manufacturing Division, The Garrett Corporation in Los Angeles, explained his tooling problem this way: *"In producing the air turbine bearing carrier for aircraft refrigeration packages, it was necessary to produce a unit with a precision shaft carrying components which rotate at very high speeds. The I.D. and O.D. are held within .0002 and normalities within .0005 on all ground diameters. Without the Woodworth Drawbar Operated Arbor it would be extremely difficult. It is absolutely necessary to have holding equipment which permits a positive drive. Selective fit arbors, or tapered arbors simply wouldn't do the job like the Woodworth Drawbar Operated Arbor."*

The two air turbine bearing carriers, pictured above in the foreground of a Cincinnati Universal Grinder, seem small and sturdy in appearance, but actually are extremely delicate. These critical parts have precision shafts carrying rotating components as high as 75,000 r.p.m. The problem confronting AiResearch Engineers was how to avoid using a selective fit arbor, with centers on each end, since using a tapered arbor was impossible due to a shoulder-type shaft hole in the bearing carrier. The answer was Woodworth's Drawbar Operated Arbor, selected as the only equipment capable of giving positive drive and having the necessary elements to assure accuracy and stability.




WRITE FOR ARBOR CATALOG 3-58

*When You Buy, Specify*

ACCURACY YOU CAN TRUST

**WOODWORTH**

1300 EAST NINE MILE ROAD • DETROIT 20, MICHIGAN

# Talking Shop...

### Incentives

WHAT MOTIVATES engineers and scientists was the subject of a recent study at the University of Michigan. As you might expect, not all were motivated by the same things, but broad groupings did emerge. The development man is most interested in seeing his ideas put to use, the research man is more concerned with getting challenging projects, but the operations man wants both. The last group, into which production engineers would usually fit, were dissatisfied because they were not treated as professionals. They crave more recognition.

### The Surge

A QUARTER CENTURY ago we heard a lot about the decline in the rate of progress. A decade ago we began to hear about the acceleration in the rate. We recently had a vivid demonstration of the latter by A C Montieth of Westinghouse. Suppose we condense the time scale of the last 50,000 years to 50—a number we can all understand.

Then:

Fifty years ago, modern man first trod the earth.

Ten years ago, he stopped living in caves.

Five years ago, he invented picture writing.

Two years ago, Christ was born.

Five months ago, the printing press was invented.

Ten days ago, electricity was discovered.

Yesterday the first plane was flown.

Television was invented fifteen minutes ago.

The first jet plane flew three minutes ago.

Satellites were placed in orbit within the last thirty seconds.

### Charge It

THE CHARGE-CARD idea for shows (*AM*—Sept 22 '58, p129) is spreading. Visitors at the Design Engineering Show in Philadelphia (May 25-28) will be able to "charge" the free literature they want the exhibitors to send.

Each visitor, after he registers, will receive a small, embossed card with his name, title, company, and address. It's similar to department store and gasoline credit cards.

When he wants to request literature or a salesman's call, he simply gives the card to the exhibitor who inserts it in a small printing device. The address is automatically transcribed, and trouble is saved all around. The visitor doesn't have to write it, and equally important, the exhibitor doesn't have to read it.

### Short Thought

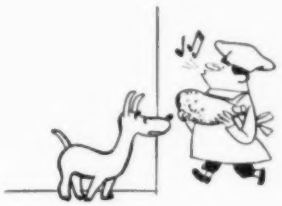
WHEN DAY is done, do you ever find that that is about all that is?

### Ultrasonic Multiples

AN 8-STATION ultrasonic machine tool has been developed by Sheffield with all eight stations operating from a single magnetostrictive transducer mounted in the well of the table. Curved ultrasonic transmission lines distribute the impulses to the working heads around the tables. It would seem but a step to the ultrasonic transfer machine.

## MEMOS

by BESS RITTER



Although the average machinist of today would question machinery made entirely of wood—especially the delicate machinery of a fine clock—in 1816 President Madison signed a patent for exactly such a timepiece. This clock was known as the "Pillar and Scroll" clock and it was so amazingly sound despite the fact that its movement required no metal at all, that some models of it are still running today.

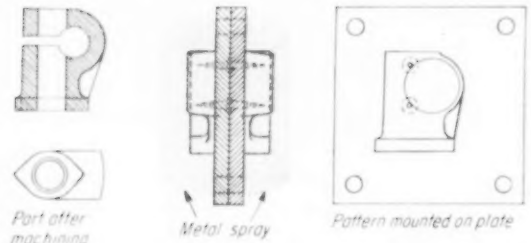
**Folks were willing to pay as much as $15 for such a clock, even though this was a considerable amount of cash in the early 1800's. These clocks were in such high demand that for a while there were more wooden-movement clocks around than there was cash—and the clocks were used *in lieu of cash*.**

A machine that was powered by a dog was common place in many kitchens in England and New England in the early 1700s, and its purpose was to turn meat on a spit in the kitchen's open fireplace. A hole was dug in the wall, high up on one side of the fireplace, and a treadwheel type cage was installed. When the dog was shut in the cage it had no choice other than running on the wheel in its very vain efforts to get out. As the dog's wheel turned, it automatically turned the slow-roasting meat.

**The dog selected had to be a small breed and was called a "turn spit" dog. When it paused to rest on the wheel, many impatient cooks actually placed live coals in the cage to speed things up. The only happy aspect of this dog-power machine, from a humane point of view, was the fact that the dog could smell fresh meat, so as soon as the latter entered the kitchen. the former mysteriously and hastily left.**

# Practical Ideas...

## Metal Spray Produces Mold




This is a process by which we have saved the cost of an expensive duplicating machine to produce molds and die-casting dies. The method is a simple approach to an otherwise lengthy and expensive die sinking procedure sometimes requiring hundreds of man hours. We have employed dies and molds made by this process for such materials as lead, brass, aluminum, and plastics.

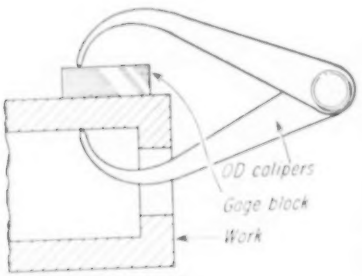
This is the way it works: A pattern is fashioned in two halves from wood or, if minute details must be included, from aluminum. In either case, the same dimensional allowances must be made for shrinkage as is conventional with die sinking. Each half is then fastened to individual plates which have been surface and edge ground as a unit. This is done to simplify subsequent machining. After the plates have been joined back to back with dowels, the pattern halves are compared, one against the other, as to location.

Beginning at the sharpest corners, usually where the pattern meets the plate, metal spray is applied. With these corners filled in, the spray is continued in 5 minute intervals, between which the spray deposit is allowed to cool. Process is repeated until $\frac{3}{8}$ in. has been deposited at the thinnest point. No separating agent is required when wood is used in the pattern or when an aluminum pattern is well polished.

When completed, the outside surfaces of the metalizing are machined to suit recesses in mating steel or cast iron blocks. The blocks provide support and adapt mold to the casting machine. Removing the pattern and installing gate and overflows completes the mold.

Working time required for the mold which produced the part shown—its dimensions are $1\frac{7}{8}$ in. high and $\frac{7}{8}$ in. thick—was 16 hours. Since we constructed this die, more than 10,000 aluminum parts have been cast with it.

*R C Gordon, Bangalore, India*




## Gage Block Aids Wall-Thickness Calibration

For the most part, bores are not difficult to gage because the work is usually arranged in the lathe so the largest bore is at the front end. There will, however, be times when this is not possible, such as is the case with the illustrated workpiece.

Here the larger bore must be machined behind a small opening. Standard tools, like an inside micrometer or calipers, cannot be used because the diameter of the opening is too small to take a reading with these tools.

We solved the problem by using a pair of outside calipers in combination with a gage block. The OD of the workpiece will, of course, first have to be machined to its finished diameter, or, at least, to a known diameter before this method can be used. The calipers are then set to the combined dimension of the required wall thickness and the height of the block. This dimension must be large enough to allow the calipers to pass over the wall thickness of the small bore.

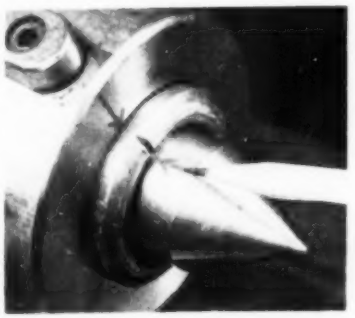
A check is made by slipping one leg of the calipers into the bore, and while it's allowed to rest on the large-bore surface, the gage block is tried between the other leg and the OD of the piece. For parts with some tolerance, a step block will serve as a Go-No-Go gage.

*Federico Strasser, Santiago, Chile*

## Lathe Center Index Marked for Accuracy

Work held between centers in a lathe demands dead true concentricity of the center points at both ends. However, when a sleeve must be used, as is the case in the photo showing a lathe spindle, the danger of misalignment is doubled. Nicked sleeve, particles of dirt, chips, or lint from wiping rags will quickly upset accuracy.

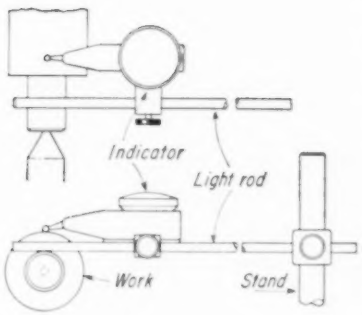
To assure alignment each time the same combination is employed, I have prepared and marked the parts as pointed out in the photo. After first making sure that the spindle bore and center are clean, the sleeve is checked for burrs or other damage. The sleeve and center are given a light film of oil, installed in the spindle and driven up tight with a lead hammer. I then grind the point with a toolpost grinder.



After it is trued, I place index marks on all three components. Because the spindle and center are hardened, these parts are marked with an electric etching pencil. The mark on the sleeve can also be etched, but for a more lasting mark in its soft material, a scribe mark emphasized with a knife file may be better.

Concentricity of subsequent center setups will only require that the surfaces are clean and that the marks line up. The tailstock center can be marked in the same manner once its concentricity has been established.

*H J Gerber, Stillwater, Okla*



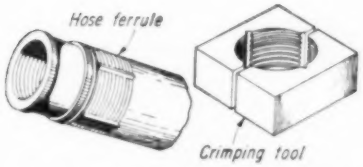

## Simple Indicator Setup Checks Concentricity

Shown in the sketch is a simple, yet effective, method of checking the concentricity between two adjacent diameters. It can be employed with the workpiece mounted between centers in the lathe or on the inspection table, or in V-blocks on the inspection table.

The check is carried out as follows: With the indicator mounted on a small-diameter rod (to provide some degree of flexibility), the rod is allowed to rest on one diameter of the work while the indicator is zeroed out on the other. These contact points should be made on a common vertical centerline for complete accuracy. As the workpiece is slowly rotated, any deviation from concentricity is easily detected.

Standard equipment to support the indicator, such as a magnetic-base stand, can be used on the inspection table. When a check is made in the lathe, the flexible rod is best held in the toolpost.

*R K Dulek, Racine, Wis*



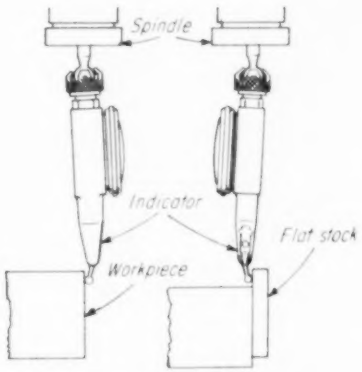

## Crimping Tool Made From Nut

When a crimp ferrule is used in attaching a fitting to a hose, a special tool is essential. However, if such an installation only becomes necessary once in a while, the purchase of such a tool can hardly be justified.

We recently discovered that a neat workmanlike job of crimping can be done with a simple square nut split into two halves. After selecting the right size nut, it is sawed through the center of the threaded bore. All four inside corners are then filed to 45° bevels, and a 90° notch is cut through the threads in the center of each half. A square nut was chosen because it is easier to hold in a vise, but a hexagonal nut may also be used.

To use the tool, the fitting and ferrule are mounted on the hose and a half nut is placed on either side of the ferrule. The whole assembly is then gripped over the flats of the nut and given a gentle squeeze. When released, the ferrule will appear as shown in the sketch.

*H Koslow, Bronx, NY*




## Here's How to Find an Edge Without an Edge Finder

Many devices are commercially available, and a number of different gadgets have been made by operators of jig borers, milling machines, and boring mills to pick up the precise edge of a workpiece. While most all of them are good, I think they are all unnecessary.

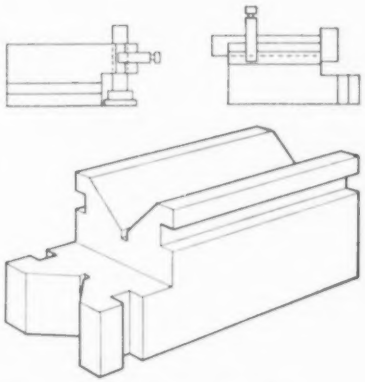
I have for many years been using a method that requires nothing more than an indicator and a piece of ground flat stock. To me, this method is faster and certainly just as precise and foolproof as any other I have seen.

This is how it works: A rough pickup is made in the same manner as when an edge finder is to be used, which is usually with a wiggler. An indicator is then chucked in the spindle and the contact ball placed against the workpiece, as shown at left in the sketch. A slight rotary motion of the spindle (both ways) quickly shows the low-point reading of the dial.

The spindle is then raised enough to clear the top of the work and rotated a half turn. Any small piece of flat-ground stock is next placed against the edge of the work with a small part extended beyond its top face. With the contact ball of the indicator against the piece of stock, the spindle is rotated as before to show a low point.

The difference of the low points is then split and a check is taken to verify spindle position. The result is a dead-zero reading which can be used to pick up any point on the workpiece that may be inaccessible by any other method than working from the edge.

*William G. Reinbold, Emmaus, Penna*



## Special V-Block Simplifies Headed-Punch Grinding

A punch or ejector pin with a head at one end is easily held for shapening or grinding to length in the combination V-block shown. This tool eliminates doing the grinding at the end of the magnetic chuck to allow the head to overhang the edge. And, very often, when a punch is short, this method can't be used because of the height of the work holder.

The V-block is made in the same manner, and with the same care, as a standard block with the exception of the base, which is extended and formed into a vertical V. Square grooves are machined on both sides of the block, horizontally and vertically, to accept a clamp so the block can be used in either position.

*Howard Levy, Brooklyn, N Y*

# Practical Ideas...

## Hydraulic Auto Jack Doubles as Portable Press

A machine shop engaged in the manufacture of gas lift valves and other oil-field equipment uses this rig for press-fit assembly. It consists of a frame built around a hydraulic auto jack with a sliding shelf attached to the jack spindle.

The frame is made up of a heavy steel-plate base and a strongback bar which are joined by two 1¼-in. rods. Long running threads are machined on the top ends of the rods and fitted with hex nuts; one below and one above the strongback on each rod. This provides the necessary adjustments for the jobs handled with this press.

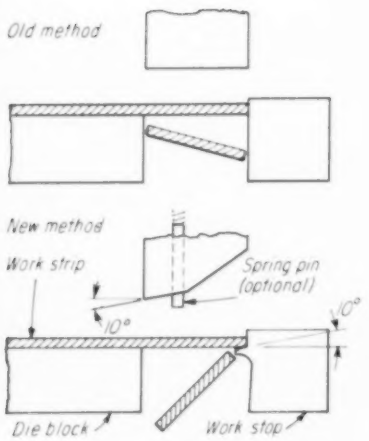
With the aid of the sliding shelf, the jack spindle is guided at the point of contact with the work to prevent accidents. The base of the jack is bolted to the base of the frame.

*Harry Hess, address unknown*

## Modified Punch Cuts Stock Squarely

A progressive die we had recently constructed was giving us trouble at the cut-off stage. The die was designed to produce parts without scrap between stations so a conventional flat-end cut-off punch was used. The result was that the parts received an angularly ripped edge which was non-acceptable to the customer.

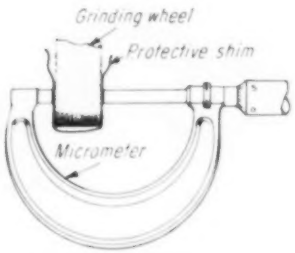
This problem was easily remedied with a modification of the punch and a new stop. The cutting edge of the punch was ground back to a 10° angle for approximately 40% of the punch width. The rest of the punch




was then relieved at about 35°. A spring pin—to push the parts down after cut-off—was also incorporated, but we found that the punch worked as well without it.

The stop was changed to present a lip directly under the work-contact surface. This was designed to tilt the workpiece immediately following its separation from the stock strip. The little work involved in refinement paid off well.

*Charles Sarruda, Quincy, Mass*




## Shim Protects Micrometer in Measuring Abrasives

Before form grinding or slotting with a grinding wheel can be done accurately, it is usually necessary to dress the wheel to a certain thickness. However, if a micrometer is used directly on the wheel, the anvil and spindle faces of the mike will quickly be damaged.

To avoid excessive wear and still get an accurate measurement, fold a piece of light shim stock to form a shield on each side of the wheel while a reading is taken. The double thickness of the shim stock is then subtracted from that reading to find the exact thickness of the wheel.

*Howard Levy, Brooklyn, N Y*

**A K Das, Dum Dum, India & J McQueenie, Ayeshire, Scotland have won**

**$25 In addition to regular payment for their ideas:**

**SELF-ADJUSTING CLAMP HOLDS DISSIMILAR PARTS**

**HOW TO MILL A SQUARE HOLE**

**in the March 9, 1959 issue**

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

**PAYMENT**—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

**JUDGES**—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

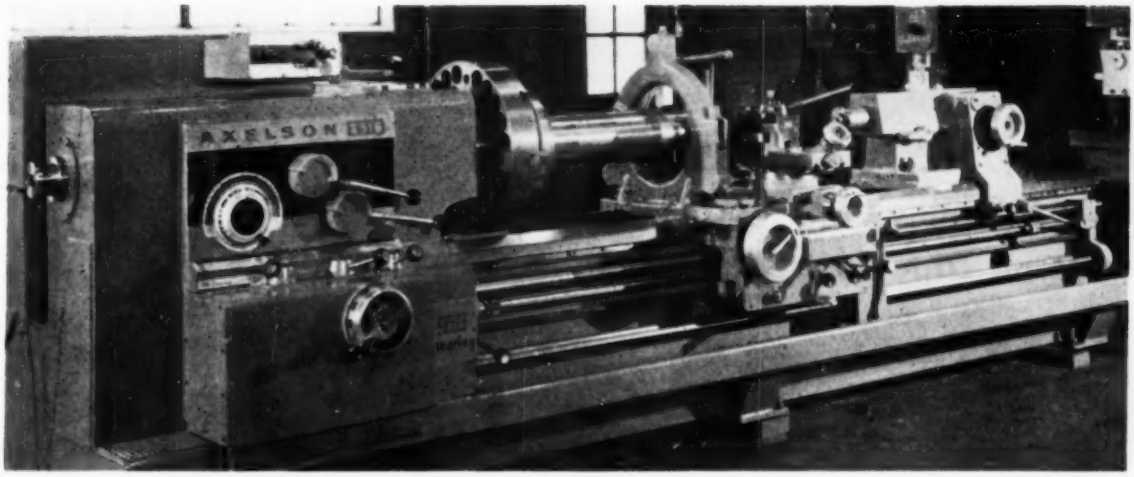
**REQUIREMENTS**—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

**WHO MAY ENTER** — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

**HOW TO ENTER** — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N.Y.

# New Shop Equipment

## Materials and Parts




## Clearing Lathe Has Modular, Welded Steel Construction

New type of engine lathe introduced by Clearing features welded steel construction and modular headstock and bed. Reported to be 18 times more rigid than cast iron, the lathe was specifically designed to machine superalloys with carbide or ceramic cutting tools.

The Clearing-Axelson lathe offers 88 feeds and 40 spindle speeds, ranging up to 2000 rpm. It has a 25-in. swing over ways, a 16-in. swing over cross-slide, and can be equipped with motors up to 50 hp. Rough threading and heavy interrupted cuts are said to be handled without perceptible chatter.

Designed on the building-block principle, the headstock and bed are separate units from the floor up. The headstock contains the drive and feed units, the electrical controls, and operating console.

The feed gear box is completely enclosed and attaches to the front of the machine complete with hand wheels and levers. All electrical accessories are contained in a single enclosure mounted in a recess in the headstock. Drive gearing, quick change gear box and electricals may each be removed as a unit to simplify servicing. Standard gear shifting on this Blue Chip Line of lathes is manual with a four-position and a five-position lever operating in two ranges to take care of all speed changes. Power assisted and full power shifting are available as relatively lowcost options. Direct drive type mounting has been replaced by steel cable V-belt drive to the spindle. Other features include a quill mounted center bearing and large diameter spindle.

### Extremely rigid beds

Beds are available in lengths from 10 ft. They are mounted to the sides of the headstock by a thick, extra wide flange. Bed and headstock joint is vertical with alignment assured by having large-size rectangular keys in both the horizontal and vertical plane. Weldment construction made it possible to design the entire bed with continuous reinforcement from end to end. Pedestal, bed, and ways are built as an integral unit, with the front wall of the bed extending to the floor. Chip pan extends considerably forward to add strength to the structure. Ribs are placed inside to form a series of pyramid shapes. Steel plates on the lathe are a minimum of ¾-in. thick. This type of heavy, rigidly braced construction is said to eliminate resonant vibration.

All beds are annealed in a furnace which is heated to 1200 F and slowly cooled to assure that all welding stresses are taken out of the structure. According to the manufacturer, the bed would have no more tendency to distort under actual use than an equivalent cast iron bed.

Clearing used welded steel construction because they felt it was the only practical way to get the desired rigidity. In addition it offered manufacturing economies over cast iron construction. Redesigned from the ground up, this line of lathes is claimed to be the first to take full advantage of the freedom of design possible with welded steel.

### Some cast construction

On the other hand, Clearing didn't use weldments where castings would serve just as well. Cast construction is used for the quick change gear box, tailstock, apron, and cross-slide. The tailstock, for instance, is made of cast iron with a minimum tensile strength of 30,000 psi. A side-mounted thrust lock on the lathe is designed to make tailstock locking easier. The new tailstock also incorporates a zero setting digital counter believed to be first in the industry.

*Clearing Div of U S Industries, Inc, 6499 W 65th St, Chicago 38, Ill*

MORE DATA? Circle 52, inside back cover

## Pratt & Whitney Numeric-Keller Machine Performs Tape-Controlled Milling in 3-D

Continuous automatic milling of regular and irregular shapes in three dimensions to a high degree of accuracy, under direction of tape-reading numerical control, is accomplished by the new Numeric-Keller machine.

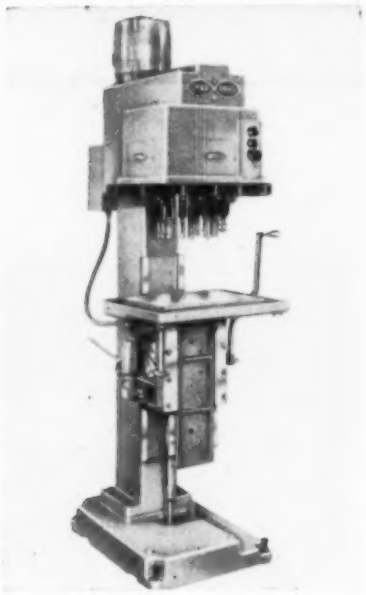
Horizontal and transverse movements of the table on which the work is mounted, the vertical movement of the cutter spindle, and the feed rates, are automatically controlled by punched tape. Operator needs only to push the button to start the tape, change the tooling as required, and set the spindle speeds. Machine can be used for both short and long run production and is reported to be equally capable of very heavy and very delicate work.

Built-in control devices, in the form of automatic error-detecting circuits and continuous digital feedback controls, automatically shut down machine if any malfunction is detected, or adjust motions if errors occur. Jogging controls allow operator to stop machine, withdraw cutter spindle, change tool, return to machining position, and continue under tape control without loss of synchronization.

Eighteen spindle speeds range from 40 to 3600 rpm. Table travel is 36 in. horizontal and 12 in. transverse; vertical slide moves 22 in. Table working surface measures 48 x 30 in. Power for the three movements is furnished by a hydraulic system that generates 1500 psi and delivers 7½ hp to any of the feed motors. Operator can override the machine feed manually within a range of from 20 to 100% of the programmed feed rates, if in his experience this is desirable.

*Pratt & Whitney Co, West Hartford 1, Conn*

MORE DATA? Circle 53, inside back cover



## Drilling-Tapping Machine Said To Cost Half of Similar Units

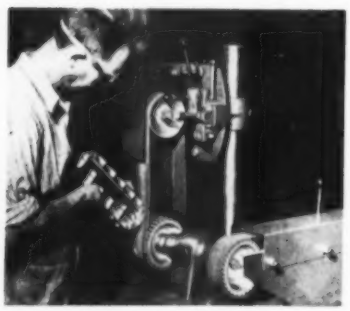
Multiple-spindle drilling and tapping machine which lists at $1,998.50 for the manual model (above) and $3545.75 for the hydraulic model represents savings of approximately 50% in capital outlay for equipment of comparable quality, according to the manufacturer.

The two Deka-Drill models are essentially alike, except that M 712 is operated by hand or foot pedal and H712 is a fully automatic machine tool. They are equipped with a 2-hp, 1200 rpm, 3-phase motor. At 60 sfpm and 1½-ipm feed, drilling capacity is six ⅜-in., ten 5/16-in., or fourteen ¼-in. holes. At 75% thread and 20 ipm fed, tapping capacity is five 5/16-18, eight ¼-20, twelve 10-22, or fourteen 8-32 taps On Model H 712, the hydraulic pump is driven by a 1½-hp motor.

Innovations include a self-contained, manually operated hydraulic lift to raise the knee and a ram-type slide construction for support and actuation of the table and knee. Gears, bearings, and spindles are designed to withstand seven times maximum tool pressure. Lower arms are made of cast iron with cast bronze spindle bearings, adjustable vertically 1 5/16 in. Upper spindle arms consist of two universal joints connected by a hexagonal driving shaft.

*Precision Tool and Mfg Co, 1305 S Laramie, Cicero, Ill*

MORE DATA? Circle 55, inside back cover



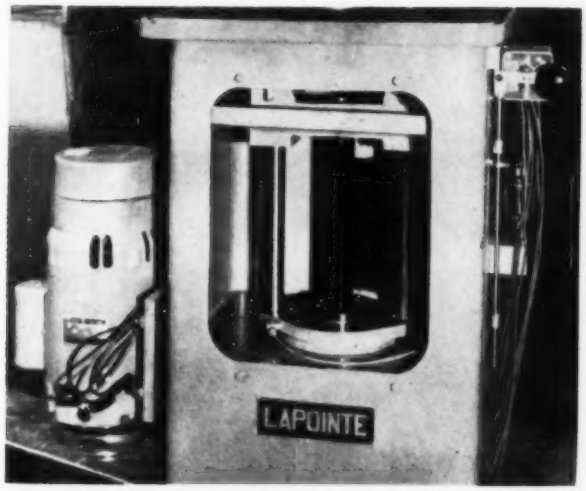
## Rockwell Introduces Lowcost Line Of 2½-in. Belt Grinders

In addition to the four standard setups—single horizontal, double horizontal, horizontal and vertical, and double vertical—a variety of accessories is available which makes it possible to build economical special job setups. These include vertical support unit, safety guards, dust and chip chute, fully adjustable platen, dust collector, and an adjustable toolrest for grinding. A 4-in. backstand idler unit is also available.

Standard equipment includes the arbor head, rubber contact wheel, 2¾-in. backstand idler unit, and an abrasive belt. Belt speed is 5400 fpm with 6-in. contact roll using standard 1725 motor. Price, without motor and switch, for the single horizontal setup is $129.50.

*Rockwell Mfg Co, Walker-Turner Div, 400 N Lexington Ave, Pittsburgh 8, Penna*

MORE DATA? Circle 54, inside back cover




## Low-Priced Broaching Machine Introduced For Short-Run, General Purpose Operations

The Eager Beaver small pull down Lapointe broaching machine is rated at 1½ ton at 5 fpm broaching speed, and ¾ ton at 10 fpm. Built with a 12-in. stroke, it is priced at $970 with two cutting speeds and mechanism for adjusting the stroke as standard equipment.

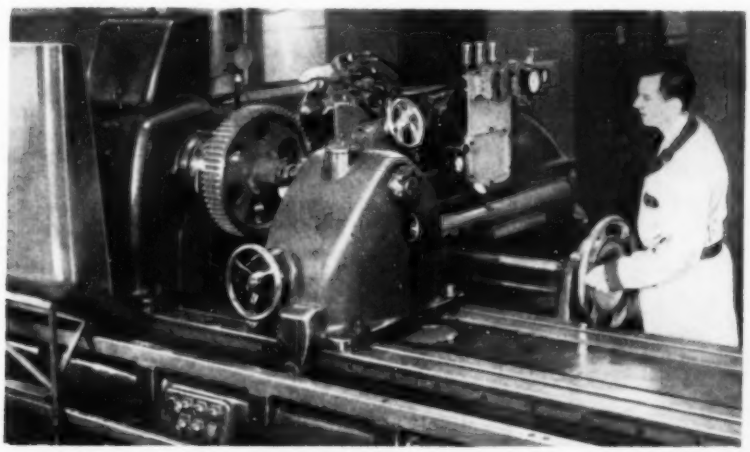
It is designed for short-run, general purpose broaching, with the expectation that it will be used for operations that had formerly been machined by other methods.

This bench-size machine is 31 in. wide, 20 in. front-to-back, and 34 in. high. Hole in the drawhead is 1½ in.; hole in the platen is 5 in., and the platen working surface measures 17 by 18½ in. Drive is of the mechanical screw type. Weight is 500 lbs.

Built for precision broaching, it is suitable for broaching close tolerance missile parts. The machine can handle such parts as lock cylinder barrels, slots, and other internal applications, and in some instances can do external or surface broaching.

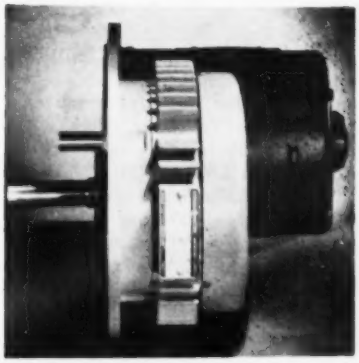
*Lapointe Machine Tool Co, Hudson, Mass*

MORE DATA? Circle 57, inside back cover



**GEAR TOOTH HONING PROCESS** can be applied to spur and helical gears with 12 to 200-in. diameters by using separate tool heads and feeding mechanisms that enable one large rotary machine to perform both the gear tooth shaving and honing operations. Illustration shows the tilting honing head on a prototype machine performing a finishing operation—*National Broach and Machine Co, 5600 St Jean Ave, Detroit 13, Mich*

MORE DATA? Circle 58, inside back cover



### Thinline Motor 26 lbs Lighter, 55% Shorter Than Similar Units

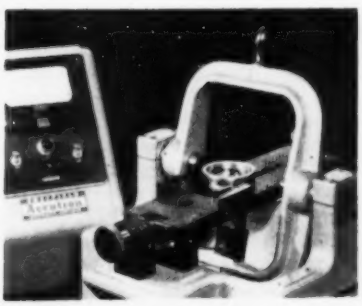
Thinline motor designed for such applications a machine tools, fans, and blowers is up to 55% shorter and 26 lbs lighter than standard NEMA type D flange motors of the same rating. It is available in polyphase drip-proof and enclosed construction from 1 to 5 hp at 1800 rpm.

Size and weight reduction of the new motor is accomplished by using formed end turn windings. Each rating can be furnished with a choice of three flanges: one with NEMA type D flange dimensions, and two special flanges without mounting rabbetts.

Three-piece construction, a frame and two end shields, provides ease of disassembly for inspection, cleaning, and regreasing. In the even of motor burnout the stator can easily be removed for rewinding or replacement.

*General Electric Co, Schenectady 5, NY*

MORE DATA? Circle 59, inside back cover



### Electronic Gage Checks Contours to Ten Millionths

Deviations as small as 0.000010 in. in the curvature of inner and outer bearing races can be detected by the Accutron Electronic Gage. It can also be used to inspect the radius of other types of precision parts.

Equipped with standard compo-

nents, the gage checks race curvature of inner and outer bearing rings from ⅜ to 6 in. OD, ball size from 1/16 to ⅝ dia. With additional components for miniature bearings the gage checks inner rings with 0.050 to 0.500 in. OD, outer rings with 0.075 to 0.500 in. ID.

The counterbalanced swing arm, with a frictionless type gage cartridge and pickup stylus mounted to the lower member, sweeps the curved surface of the bearing with light, constant pressure. The swing arm rotates through the gaging arc on solid bearings ground and lapped to an accuracy of 0.000005 in.

*Sheffield Corp, Subsidiary of Bendix Aviation Corp, Dayton 1, Ohio*

MORE DATA? Circle 60, inside back cover

## Magnetic System Detects Surface, Sub-surface Flaws

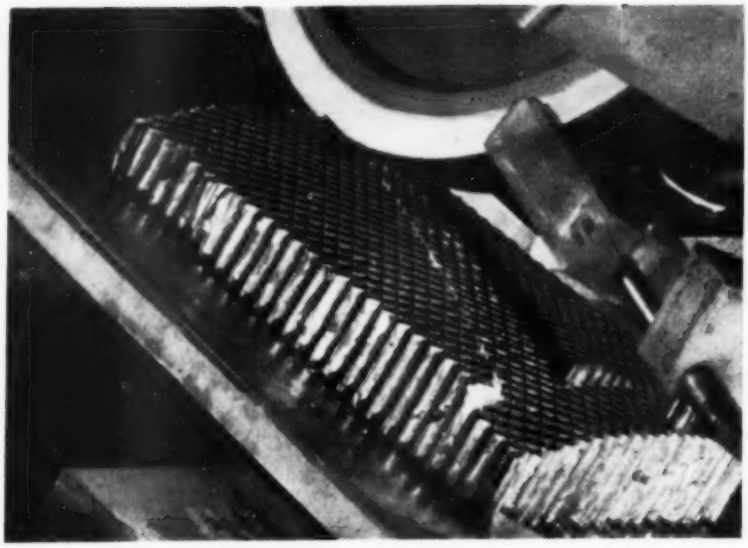
Portable magnetic inspection system detects surface and subsurface defects in ferrous metal parts and assemblies and also demagnetizes the part after inspection. Known as Detectascope, it is designed to locate deep subsurface cracks, laps, voids, grinding, welding, and heat treating cracks, even through painted or plated surfaces.

It works like this: electromagnet is placed on part to be inspected, current is turned on, and area to be inspected is painted with an oxide solution. Iron particles in the solution concentrate wherever there is a defect.

The unit consists of a removable electromagnet and demagnetizer unit, extension cord and foot switch, black light hood assembly, transformer, five gallon tank, agitating pump, and voltage regulator—all mounted on a mobile cabinet. It is 52¾ in. high, 36 in. wide, 18½ in. deep. Weight is 150 lbs. Price is $795.

*Ferro Machine and Tool Corp, 5514 W Washington St, Indianapolis 41, Ind*

MORE DATA? Circle 61, inside back cover



## Stainless Steel Honeycomb Contour Cut By Tracer-Controlled Electrolytic Process

Complex contours in stainless steel honeycomb can be machined by the electrolytic process by using a modified tracer method together with a special control mechanism developed by Ekstrom, Carlson.

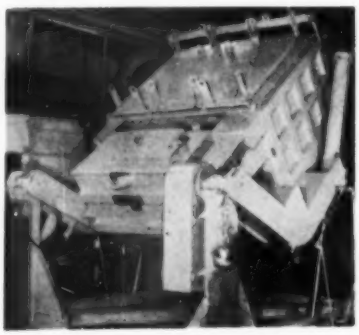
Almost any shape, profile, or contour that can be machined on solid metal can be duplicated on honeycomb. Recesses, cavities, involute curves, diagonals, and spiral cuts (illustrated) can be machined to close tolerances quickly and easily.

Honeycomb machined by the electrolytic process is free from burrs or metal layover; skin brazing is simplified and the bond is perfect; no heat is generated to cause metallurgical alterations; there are no heat checks or grinding cracks, and surfaces are stress free.

Details of the control mechanism and tracer operation are being withheld by the company pending clarification of the patent situation.

*Ekstrom, Carlson and Co, 1400 Railroad Ave, Rockford, Ill*

MORE DATA? Circle 62, inside back cover



## Aluminum Induction Holding Furnace Has 30,000-lb Capacity

This aluminum induction holding furnace, equipped with a three-section hydraulically operated cover, has a 30,000-lb capacity.

The shell is mounted on heavy-duty bearing trunnions and supported on structural steel legs. Chamber lining is of monolithic construction and is non-wettable to aluminum. Tilting mechanism operates by fingertip control. Pouring lip is located in the axis of tilting to provide a constant pouring arc regardless of the furnace tilt so that ladles or molds need not be shifted during pouring.

Two 10-in. bore, 84-in. stroke hydraulic cylinders operating at 750 psi are used for tilting. The cover is operated by two 2-in. bore, 25-in. stroke hydraulic cylinders at 750 psi. The cover can be removed as a whole or in sections for cleaning.

Power requirements: 350 kw, 480 v, single phase, 60 cycles ac. Dimensions: 17½-ft long by 15-ft wide by 10 ft high. Weight of the furnace is 75,000 lbs.

*Lindberg Engineering Co, 2450 W Hubbard St, Chicago 12, Ill*

MORE DATA? Circle 63, inside back cover

# V-R TANTUNG®

# Designed for cutting speeds between high speed steel and carbides

SOLID TOOL BITS
•
CUT-OFF BLADES
•
CAST-TO-FORM
•
TIPPED TOOLS

V-R TANTUNG bridges the gap between maximum cutting speeds of high speed steel and practical minimum speeds of cemented carbides . . . and it's easy to grind with aluminum oxide wheels.

High red-hardness; high transverse rupture strength; low coefficient of friction and high shock resistance are a few of the characteristics which make TANTUNG cast alloy the ideal tool material for intermediate cutting speeds.

Ask your V-R representative to show you how TANTUNG can cut costs on many of your machining operations. He will also be glad to give you full information on V-R Ceramic and Carbide cutting tools for your higher speed jobs.

"Where and How to use TANTUNG" — Facts about all types of TANTUNG tools . . . how to grind and braze . . . examples of production cost-savings, etc. Ask for Booklet No. 573.

## V-R Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB

T-706

834 Market Street • Waukegan, Illinois

# ACCURACY

## When You Buy from Your Local P&W GAGE SPECIALIST

Not just an "Order-Taker," but a *specialist* trained to give you expert application engineering service, this man can help you select the best gages for your specific applications . . . from the complete lines carried in stock at your local P&W Branch Office. He will show you how you will benefit from the improved gaging precision, greater dependability and longer wear life made possible by the greater skill and care that go into the manufacture of P&W Gages.

There's a P&W Branch Office near you. Phone today, and take advantage of the convenient stocks, assured gaging dependability, and expert application engineering service that are all yours for the asking.

**BIRMINGHAM, Alabama**
Phone TRemont 1-0482
**BOSTON, Massachusetts**
Phone Kirkland 7-5875
**BUFFALO (Tonawanda), New York**
Phone UNiversity 8804
**CHARLOTTE, North Carolina**
Phone EDison 2-7774
**CHICAGO, Illinois**
Phone HUmboldt 9-1626
**CINCINNATI, Ohio**
Phone PArkway 1-3112
**CLEVELAND, Ohio**
Phone ORchard 1-7216
**DALLAS, Texas**
Phone FLeetwood 2-1709
**DENVER, Colorado**
Phone DExter 3-4418
**DETROIT, Michigan**
Phone DIamond 1-1070
**HOUSTON, Texas**
Phone WAlnut 6-9643
**JUPITER, Florida**
Phone 4535
**LIVINGSTON, New Jersey**
Phone WYman 2-5353
**LOS ANGELES, California**
Phone ANgelus 3-7506
**MILWAUKEE, Wisconsin**
Phone GLenview 3-7650
**NEW YORK CITY (Flushing), New York**
Phone INdependence 1-6363
**PHILADELPHIA, Pennsylvania**
Phone WAlnut 2-1140
**PITTSBURGH, Pennsylvania**
Phone POplar 1-7212
**PORTLAND, Oregon**
Phone ATlantic 7-1867
**ROCHESTER, New York**
Phone LUdlow 6-6212
**ST. LOUIS, Missouri**
Phone CEntral 1-6770
**SAN FRANCISCO, California**
Phone MArket 1-7363
**SEATTLE, Washington**
Phone MAin 4-1141
**SYRACUSE, New York**
Phone HOward 3-8214
**WEST HARTFORD, Connecticut**
Phone ADams 3-7561

**Plus resident specialists in:** ALBANY, New York; FLINT, Michigan; INDIANAPOLIS, Indiana; MINNEAPOLIS, Minnesota; ROCKFORD, Illinois; SPRINGFIELD, Ohio; TOLEDO, Ohio; WICHITA, Kansas

**PRATT & WHITNEY**

*FIRST CHOICE FOR ACCURACY*

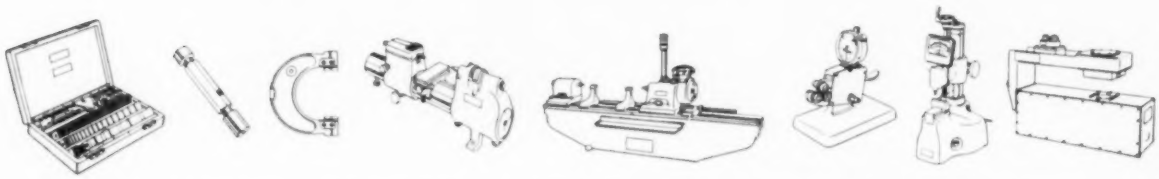
**MACHINE TOOLS • GAGES • CUTTING TOOLS**

# ASSURED...

## DEPENDABLE ACCURACY
## ...that lasts longer!

Pratt & Whitney HOKE® and USA Gage Blocks are accurate to millionths for size, flatness and parallelism. They *stay accurate longer*, because P&W gives extra care and attention to every detail of manufacture that can contribute to higher quality and better wear resistance. Remember, wherever precision measurement is concerned, the finest always costs less in the long run . . . so make your choice P&W and be *sure* of the finest!

For additional information about P&W Gage Blocks – and other gages in the complete P&W lines – consult your local Pratt & Whitney Gage Specialist. The expert gage application engineering service he provides, at no extra cost, can help you improve your precision standards and cut gaging costs. If you prefer, write direct to Pratt & Whitney Company, Inc., 11 Charter Oak Boulevard, West Hartford, Conn.



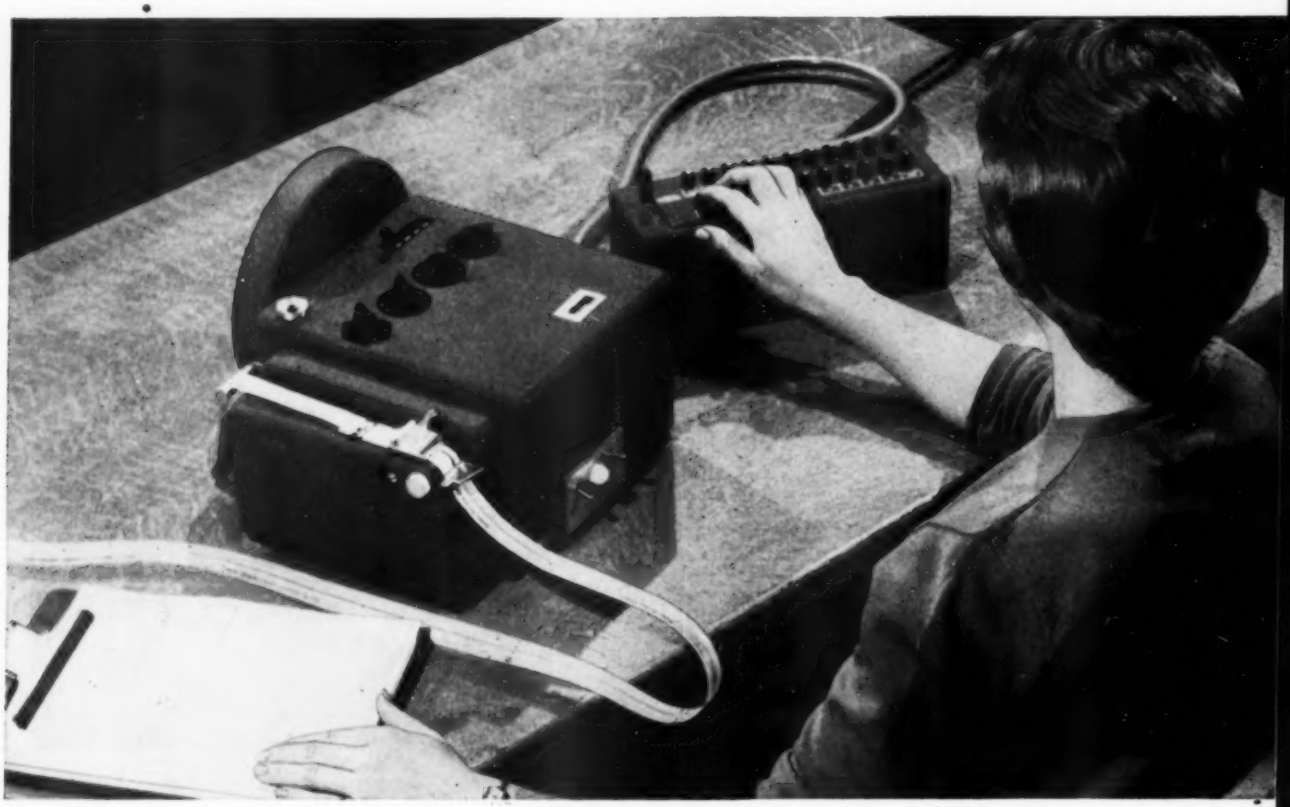
GAGE BLOCKS • CONVENTIONAL GAGES • SUPERMICROMETERS • STANDARD MEASURING MACHINES • COMPARATORS • AUTOMATIC AND AUTOMATION GAGES



CIRCLE 281 READER SERVICE CARD

# Here's the PRACTICAL* approach

## POTTER & JOHNSTON



*SIMPLE . . . to understand, operate and maintain.

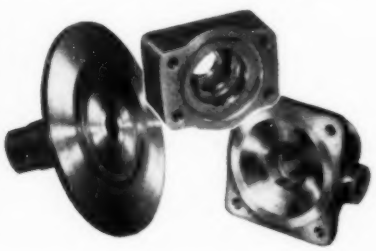
*LOW COST . . . priced far below other tape control systems.

*SAVES TIME . . . as much as 25%.

**PREPARING THE INITIAL TAPE TAKES LESS THAN 30 MINUTES . . .** for the average job, and preparation is readily handled by any clerical or other non-technical employee. Since the tape is easily stored for re-use, additional time is saved on every repeat run. Using a simple code table, a "program chart" is first prepared from the regular operation sheet. No mathematical computations or conversions are involved. Following the coded data on the program chart, the tape is then punched, using the compact tape preparation unit. This is equipped with easily set dials for moving the tape to the correct address points . . . and clearly marked buttons that are pressed to punch all necessary machine commands into the tape.

**ALL PROGRAMMING SETUP TIME IS ELIMINATED . . .** by simply placing the tape in the machine's tape reader —which takes only a couple of minutes. Unusually compact, the controls are installed as part of the machine and occupy no additional floor space.

**PARTS ARE COMPLETED IN MINIMUM TIME . . .** under tape control, because the entire machining cycle is programmed by the Engineering Department instead of the setup man. As a result, machine spends *more* time cutting metal, *less* time "cutting air."

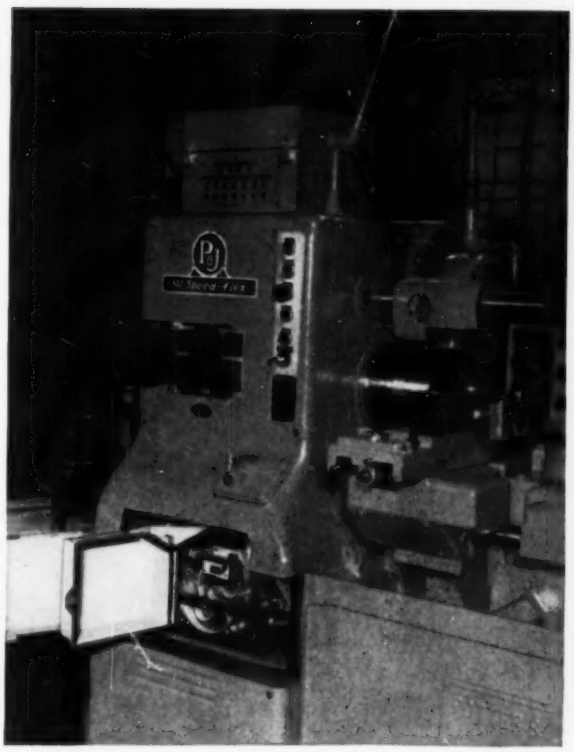


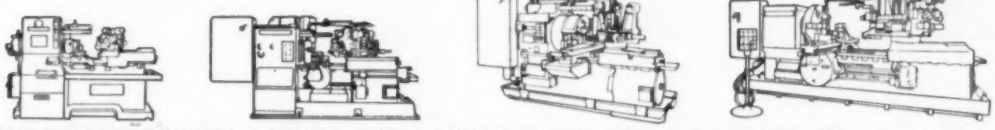
# to Automatic Machine Programming

# TAPE CONTROL

Potter & Johnston Tape Control is a unique new type of control system that makes the advantages of automatic programming available on a practical, economically realistic basis. The very low initial cost of $3,500.00 is possible, because of its simplicity. It is not electronic, and therefore requires no tubes or transistors. Unlike other systems, P&J Tape Control can be easily added to current models of Potter & Johnston Automatics already in the field, in addition to being available on new machines.

Operating under the P&J Tape Control System, all motions of the machine's spindle, turret and cross slides—including all speed and feed changes—are controlled by a quickly prepared plastic tape. As a result of the increased efficiency made possible by this system, a manufacturer using a P&J Tape Controlled Automatic in regular production has already reported savings of 25% in machining and setup time. In addition, the cost-cutting benefits of automatic machining are now made available for many production runs involving 25 pieces or less.





. . . . AUTOMATIC TURRET LATHES WITH CHUCK SIZES FROM 6 INCHES TO 42 INCHES . . . .

**POTTER & JOHNSTON**

*SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.*

**PRECISION PRODUCTION TOOLING SINCE 1898**

***YOU'LL FIND ALL THE TIME-SAVING FACTS . . .***

*on P&J Tape Control in this new circular. Use the coupon here to send for your free copy. See for yourself how this unique system can provide the practical, simple answer to your profit-building, cost-cutting requirements.*
*Potter & Johnston Company,*
*11 Charter Oak Boulevard*
*West Hartford, Connecticut*
*(formerly Pawtucket, R. I.)*

**POTTER & JOHNSTON Company,**
**11 Charter Oak Boulevard, West Hartford, Connecticut** (formerly Pawtucket, R. I.)

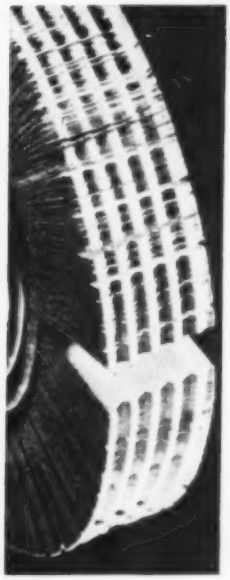
Please send my free copy of Bulletin No. 176 fully describing P&J Tape Control for Automatic Turret Lathes.

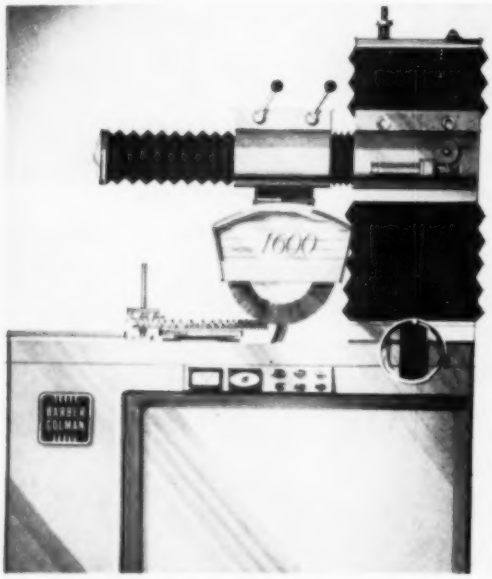
NAME_____ POSITION_____

COMPANY_____

CO. ADDRESS_____

CITY_____ ZONE_____ STATE_____






## Machine With Formed Coated-Abrasive Wheel Automatically Deburrs Gears

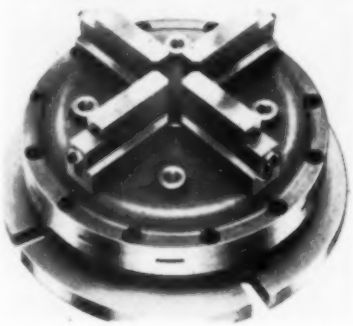
New method of deburring gears and sprockets is provided by the Barber-Colman Model 1600 Deburring Machine and a formed wheel made of hundreds of coated abrasive leaves. According to the manufacturer, Minnesota Mining and Manufacturing Co, the PG wheel does not leave a burr on either the tooth profiles of gear face, does not disturb the finish of the gear face, and provides a consistent profile from tooth to tooth and from gear to gear. A small chamfer can be ground on the complete tooth profile.

The pushbutton-controlled operating cycle works like this: The wheel is moved into working position by hydraulic action, automatically moves into contact with the gear, and, at the end of a pre-set contact period, retracts to the starting position. Wheel and gear spindles operate in a timed relationship so that the work indexes one tooth for each revolution of the wheel. The wheel is pre-formed to workpiece shape.

Specifications include: Work diameter—16 in., wheel diameter—10 or 14 in., wheel face width—1 or 2 in., wheel speed—2400 rpm, feed increments per cycle—0.0005 to 0.004 in., main drive motor—3 hp at 1800 rpm, floor space—44 by 56 in., height—60 in.

*Minnesota Mining and Manufacturing Co, St Paul, Minn, and Barber-Colman Co, Rockford, Ill*

MORE DATA? Circle 64, inside back cover



## Air Operated Diaphragm Chucks Claim Long Spindle, Bearing Life

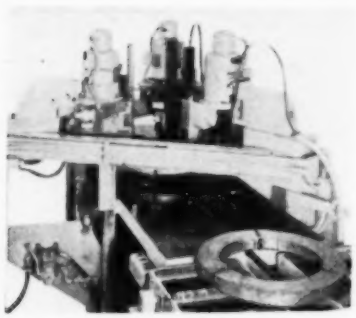
Line of air operated diaphragm chucks is said to give longer spindle and bearing life and permit higher production speeds.

The work part can be chucked either internally or externally. Air leakage is eliminated. Other features include quick-change diaphragm replacement, interchangeable jaws, and sludge slots in the periphery.

Three basic models in the new line are designated Model 5½ with capacity of ⅛ to 3 in. dia, Model 7 with capacity of ½ to 4¼ in. dia, and Model 10 having a capacity of 1 to 6½ in. dia. Piston areas are, respectively, 13.80, 24.74 and 49.68 sq in.

*Erickson Tool Co, 34350 Solon Rd, Solon, Ohio*

MORE DATA? Circle 65, inside back cover



## Power Strapping Machine Line Features Ease of Maintenance

Model M20 Series fully or semi-automatic power strapping machines use a simple mechanical design with power supplied by a standard electric motor to avoid service and maintenance problems.

Series uses strap sizes from ⅜ by 0.010 in. to ¾ by 0.035 in. and has strapping speed of 196 fpm. Stepless strap tension adjustment ranges from minimum of 50 lbs to maximum of 1600 lbs with a 3-hp motor. Unlimited strap chute size and strap take-up accommodate all sizes of containers.

Machine illustrated is for automatic strapping of strip steel coils using three straps simultaneously at rates up to 1000 coils per hour.

*Signode Steel Strapping Co, 2600 North Western Ave, Chicago 47, Ill*

MORE DATA? Circle 66, inside back cover

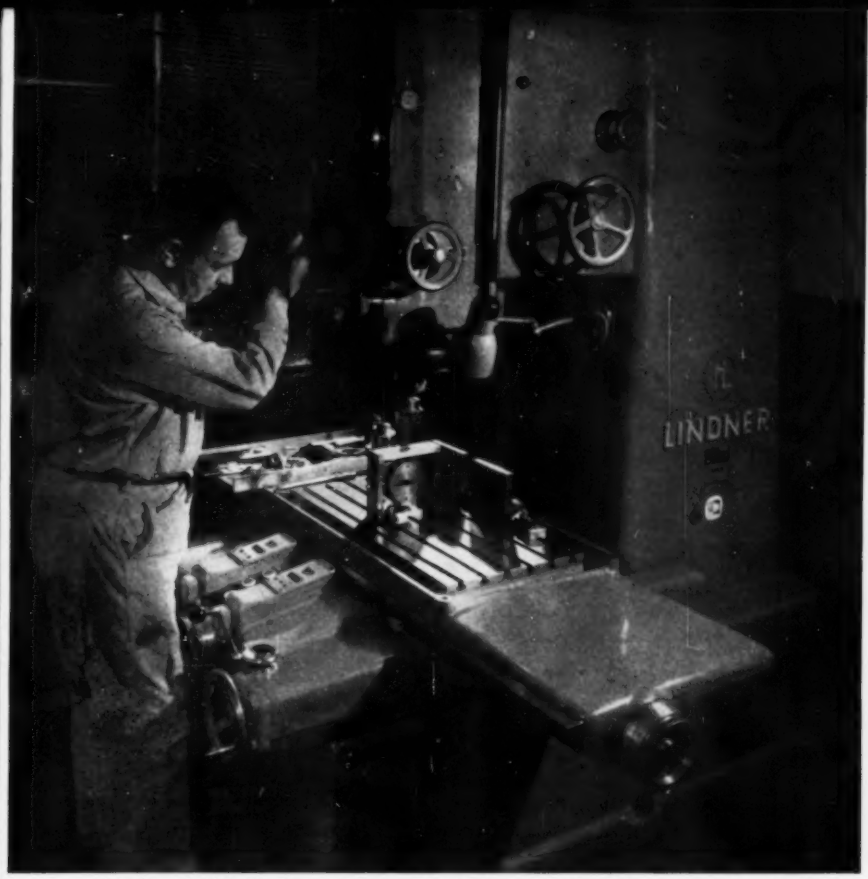
## Cartridge Spindles Featured On Universal Joint Drillheads

Cartridge type spindle plate construction on this line of universal joint drillheads provides easy removal of spindles, bearings, and other parts. Cartridge can be taken out by removing only one lock screw.

Cartridge plate is said to provide the rigidity and accuracy usually found in fixed center heads while retaining the adjustable feature for application to various hole patterns.

*Thriftmaster Products Corp, 1016A, N Plum St, Lancaster, Penna*

MORE DATA? Circle 67, inside back cover




**Lindner LB14 Jig Borer** at Philips Electronics, Inc., Mount Vernon, N. Y., has 32" x 16" table. Also available in larger model, LB15A with Autopositioner®—Table 44" x 24".

**Precision Production**—Boring 20 holes in the specimen plate cover of the Norelco Model 100KV Spectrograph. Done in one set-up. Time: 2 hours. 30% *faster than previous methods!*

**Precision Tooling**—Boring holes in a drill jig for the Norelco Powder Camera. Opposite holes must be aligned within .0001".

# How the Lindner Optical Measuring System brings greater precision to jig boring

*at Philips Electronics, Inc.*

A jig borer can be no more accurate than its measuring system. And in the Lindner the problem of maintaining *permanent* accuracy has been solved by the machine's unique *fully optical* measuring system.

No lead screws. No gage blocks. No bars or limit switches. The helically scribed, cylindrical measuring scales in every Lindner are touched by a light beam only. These scales are independent of the table movement mechanism and *immovable* in axial direction. Thus, the whole system is permanently protected against any mechanical wear whatsoever. Lifetime accuracy!

Visual fatigue and errors in settings are minimized by a photo-electric centering device. It makes possible initial and repeat settings guaranteed accurate within .00015" over the full length of travel and readings in .00005".

There's no eye strain or bending. A helical line from the measuring scale is projected onto a 2½" wide screen which the operator reads from a standing position. No eyepiece required.

That's why Philips Electronics—like so many other precision producers—relies on the Lindner for tooling, production and inspection of its Norelco atom measuring equipment and other precision research tools.

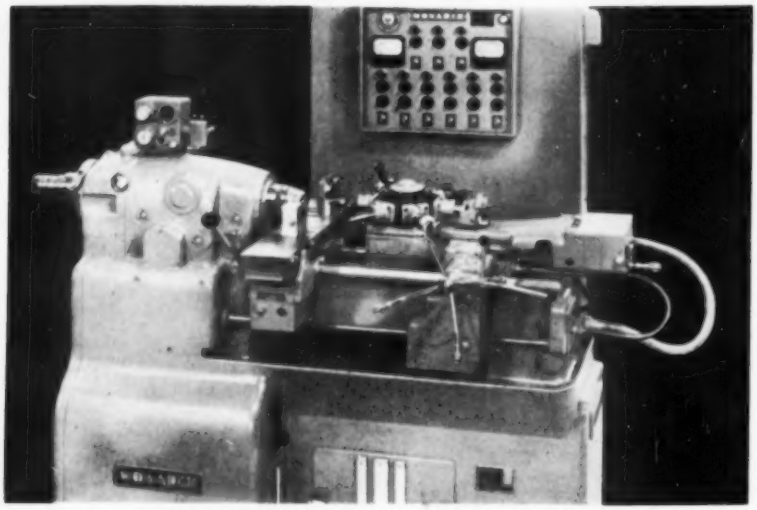
The Lindner optical measuring system is changing ideas about jig boring all over the country. We've packed all the facts into a meaty 25-minute movie film. Send for it today without obligation. Or write for literature.

KO CO., INC. PRECISION MACHINERY

**KURT ORBAN COMPANY, INC.**

36 Exchange Place, Jersey City 2, New Jersey

CIRCLE 284 READER SERVICE CARD



## Monarch Hand Screw Machine Features Simplified Controls, Hydraulic Turret

Speedi-Matic, recommended for lots ranging from less than 25 to more than 2500 pieces, features simplified electronic controls and a hydraulically powered turret.

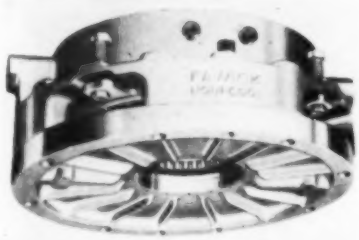
Control center provides preselected, automatic speed and feed change. A separate speed may be preset for each of the six turret positions (including a reverse speed for tap withdrawal) and for each of the two cutoff and forming slide positions. Speed range is infinitely variable from 40 to 4000 rpm; feed range, infinitely variable from ⅛ to 16 ipm. Also included in the control center are a feed indicator, a dual rpm and sfpm indicator, and a work diameter selector that provides ideal surface cutting speed without calculations.

As the power-feed, ram-type turret is manually retracted, it is hydraulically indexed, then located in the new position to an accuracy of less than 0.0002 in. by a hydraulically actuated locating plunger and clamped in position hydraulically. Retraction of the turret farther than the index position permits manual rotation of the turret head. An easily set, adjustable, positive length stop for each turret position allows quick setting for exact depth of cut. Working stroke of the turret is 5 in.

Drive to the spindle is from a 5-hp dc motor. Either an air or a lever operated pusher type collet attachment may be used, both in connection with an air-operated bar feed. Bar stock capacity is ⅞ in.

*Monarch Machine Tool Co, Sidney, Ohio*

MORE DATA? Circle 68, inside back cover



### Water-Cooled Clutches and Brakes Feature Improved Heat Dissipation

Heat dissipation rates up to 10 times greater than conventional units are claimed for these liquid-cooled clutches and brakes. Key to the improved performance is the use of copper pressure plates with spiral grooved backs in direct contact with the coolant. Friction discs are made of a material developed specially for the copper surface.

Faster heat removal from friction surfaces provides greater energy absorption per sq in. of lining area than any existing brake, according to the manufacturer. More torque capacity can be built into a given size and lining life far exceeds present performance levels.

Clutches and brakes are made in five basic sizes and in single and dual disc designs. Torque ratings for single disc units range from 4500 to 100,000 in-lbs. Dual disc units provide twice this capacity with the same diameter and mounting dimensions. Disc sizes range from 7¾ to 24 in. Internal gear drive features a straight through bore for use on shafts from ¾ to 10 in. dia.

*Fawick Airflex Div, Fawick Corp, 9919 Clinton Rd, Cleveland 11, Ohio*

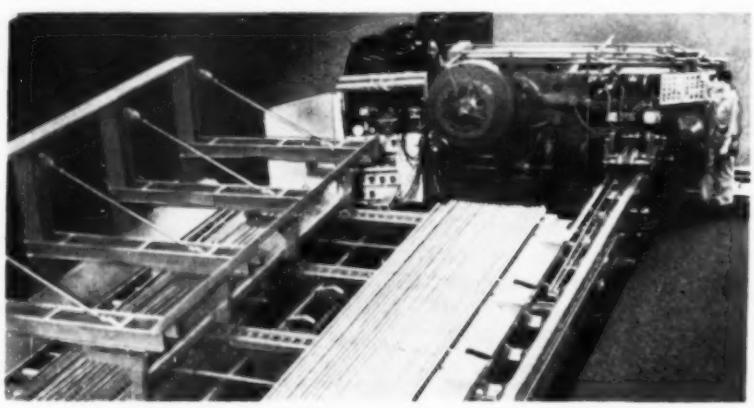
MORE DATA? Circle 69, inside back cover

### Addition of Palladium Improves Corrosion Resistance of Titanium

Addition of 0.1% of palladium to titanium forms a new alloy which is resistant to some boiling solutions of reducing acids, such as HCL, while retaining all the mechanical properties of the unalloyed metal. It can be cold and hot-worked without difficulty, according to the company. The addition of 0.1% palladium at $19 a troy ounce adds about 28 cents a pound to the price of titanium mill products.

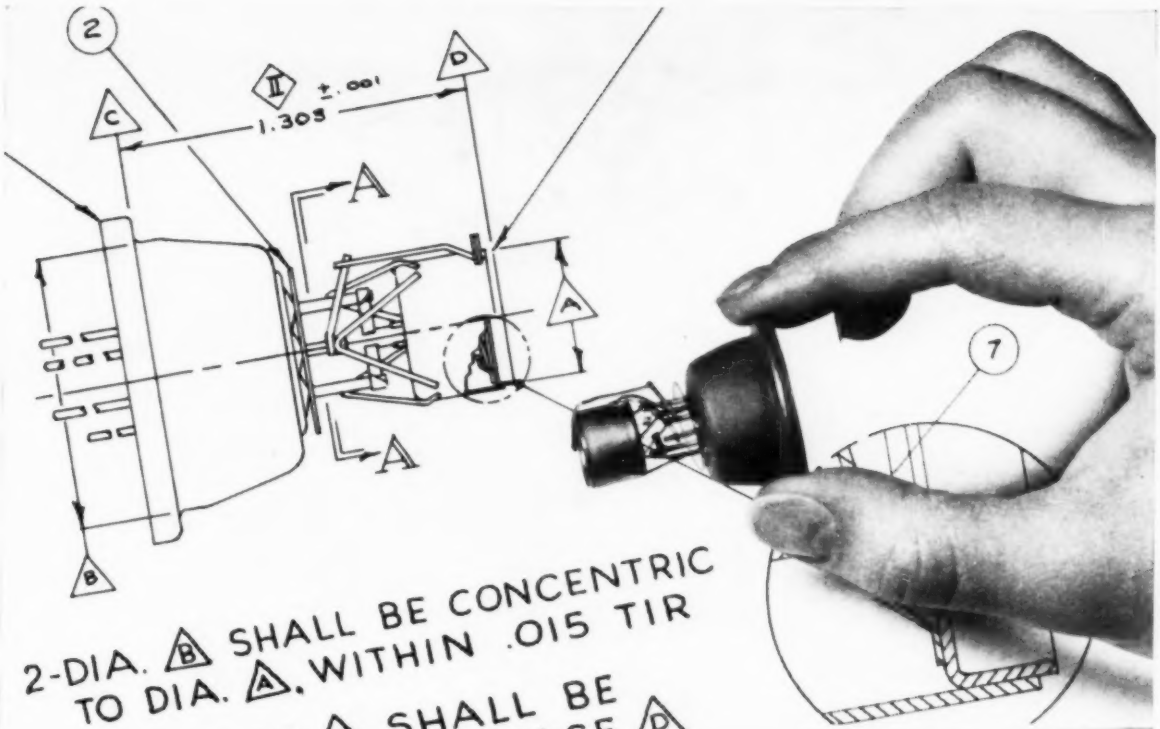
*Union Carbide Metals Co, Div of Union Carbide Corp, 30 E 42nd St, NY 17, NY*

MORE DATA? Circle 70, inside back cover



AUTOMATIC BAR SHEAR cuts pieces 12 to 50 in. long of high tensile material up to 2 in. dia. Cutting two bars at a time, the shear produces 50 pieces of cut material per minute. Only one operator is required—*Hill Acme Co, 6500 Breakwater Ave, Cleveland 2, Ohio*

MORE DATA? Circle 71, inside back cover



# "We can cut out up to 20 gaging operations on delicate parts like this."

"Many times, with a single chart and fixture on our Kodak Contour Projector, we can quickly inspect several complex part dimensions at a single pass. This cuts gaging operations and costs to a fraction of the cost of separate gaging checks," says Varian Associates of Palo Alto, Calif., makers of precision electronic parts and equipment.

*No contamination of or pressure on delicate parts (a light beam exerts no pressure, causes no wear); high-speed, accurate inspection of close-tolerance dimensions; few mechanical operations* . . . these are only some of the reasons why manufacturers like Varian find optical gaging with the Kodak Contour Projector the most practical solution to many inspection problems.

You get more with a Kodak Contour Projector. You get greater *working distance*—8" of clearance for parts and fixtures. Especially important at high magnifications.

You get more brilliant, more uniform *illumination* over the entire screen area—at all magnifications.

You get highly *accurate images* even at the critical outer edges of the screen area.

You get *upright images* of all inspected parts for easier reference.

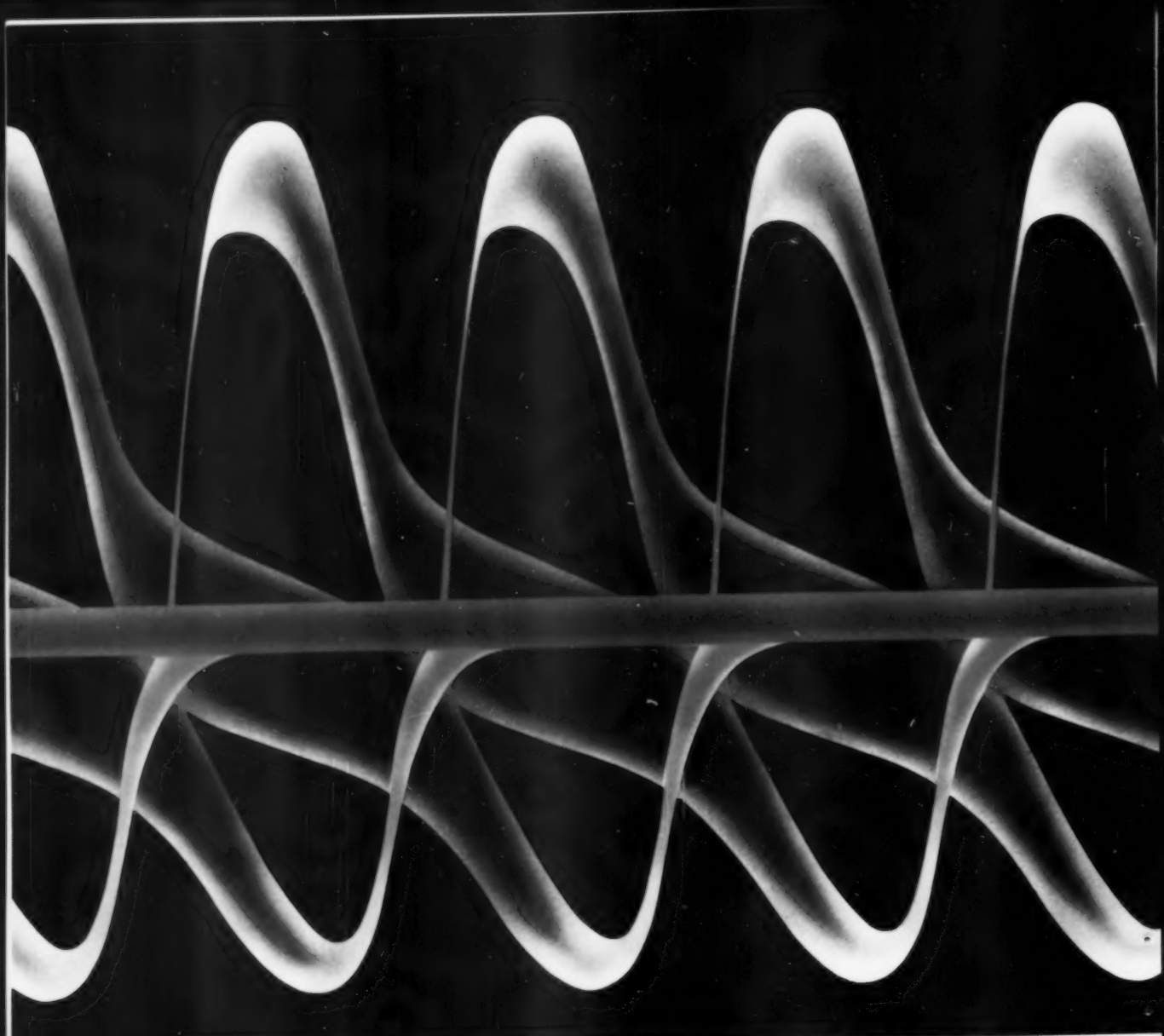
These and other features of the Kodak instrument make it more efficient and more valuable to you. Read about them by writing for the booklet, "Kodak Contour Projectors."

**SPECIAL PRODUCT SALES**

**EASTMAN KODAK COMPANY, Rochester 4, N. Y.**

***THE KODAK CONTOUR PROJECTOR***

Kodak
TRADE MARK



The cathode ray oscilloscope is one of science's and industry's most perceptive instruments for determining uniformity of operation. The pattern reproduced here is a harmonically modulated sine wave of exact uniformity.

# Uniformity is Malleable

Just as the input of an oscilloscope can be controlled to produce repetitive patterns, so can consistently uniform metal parts be produced with Malleable iron because of modern, scientific controls. The unique method by which all Malleable castings are made and the exacting techniques employed by Malleable foundries assure Malleable users of castings that are uniform, part after part, regardless of size or shape. This uniformity, combined with unparalleled physical and mechanical properties, ideally suits Malleable castings for modern America's quality products.

For information or service, call on one of the progressive firms that identify themselves with this symbol—

MEMBER

MALLEABLE

CASTINGS COUNCIL

If you wish, you may inquire direct to the Malleable Castings Council, Union Commerce Building, Cleveland 14, Ohio, for information.

# Better Products at Lower Cost Result From Malleable Uniformity Controls

Uniform quality — whether for five or five million pieces — is essential to maintain product quality and increase manufacturing efficiency. With accelerating frequency, Malleable castings contribute their unique uniformity in critical applications where durable, reliable components are necessary.

## Key to Uniformity is Control

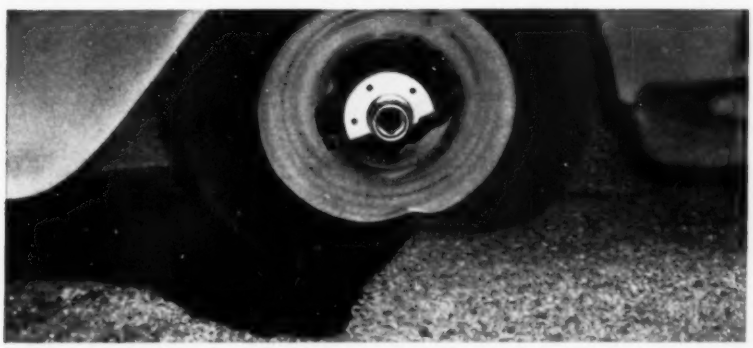
Malleable iron is produced under closely controlled manufacturing techniques. From charge composition and molding sand properties, through final inspection, every critical factor is held constant by using the most modern techniques of metal analysis, process control and inspection.

## Internal Uniformity

This versatile engineering material is achieved through converting the base white iron into tough Malleable iron by a controlled heat treating process. Malleable's internal structure exhibits excellent uniformity, an important factor in assuring the dependable performance of intricately designed components.

## External Uniformity

Fundamental to the casting process is the ability to produce a given shape, time after time, in either small or large quantities. Metal can be placed exactly where it is needed . . . eliminated where it is not. Good design — achieved through close cooperation between the customer and the foundry — can assure the necessary tolerances and the lowest possible finished part cost. Modern techniques of production and inspection are used to insure top quality, dimensionally accurate castings.



The life of every motorist rides in complete safety on Malleable wheel hubs of unerring uniformity.

## Uniformity Proven by Use

The final test of any part is how well it stands up in actual service. Under continuous cyclic and shock loading, the millions of Malleable wheel hubs, which are in service on the front end of every American-made car, have compiled an enviable record of proven uniformity. Another dramatic example of Malleable's uniformity is proved in the old adage "A chain is only as strong as its weakest link." Miles of Malleable chain, carrying tremendous loads year after year without failure, demonstrate the uniformity of every cast link.

New techniques for controlling every element of Malleable production are the result of intensive research done by Malleable foundries in their continuing search for ways to make Malleable even more versatile and indispensable to industry.

## More Information Available

Your copy of *Data Unit 103—Uniformity* — is available from any member of the Malleable Castings Council. If you prefer, write direct to Malleable Castings Council, Union Commerce Building, Cleveland 14, Ohio.

**These companies are members of the**

MALLEABLE CASTINGS COUNCIL

**CONNECTICUT**
Connecticut Mall. Castings Co., New Haven 6
Eastern Malleable Iron Co., Naugatuck
New Haven Malleable Iron Co., New Haven 4

**DELAWARE**
Eastern Malleable Iron Co., Wilmington 99

**ILLINOIS**
Central Fdry. Div., Gen. Motors, Danville
Chicago Malleable Castings Co., Chicago 43
Moline Malleable Iron Co., St. Charles
National Mall. and Steel Castings Co., Cicero 50
Peoria Malleable Castings Co., Peoria 1
Wagner Castings Company, Decatur

**INDIANA**
Link-Belt Company, Indianapolis 6
Muncie Malleable Foundry Co., Muncie
Terre Haute Mall. & Mfg. Corp., Terre Haute

**MASSACHUSETTS**
Belcher Malleable Iron Co., Easton

**MICHIGAN**
Albion Malleable Iron Co., Albion
Auto Specialties Mfg. Co., Saint Joseph
Cadillac Malleable Iron Co., Cadillac
Central Fdry. Div., Gen. Motors, Saginaw

**MINNESOTA**
Northern Malleable Iron Co., St. Paul 6

**NEW HAMPSHIRE**
Laconia Malleable Iron Co., Laconia

**NEW JERSEY**
Meeker Foundry Company, Newark 4

**NEW YORK**
Acme Steel & Mall. Iron Works, Buffalo 7
Frazer & Jones Company Division Eastern Malleable Iron Co., Solvay
Oriskany Malleable Iron Co., Inc., Oriskany
Westmoreland Mall. Iron Co., Westmoreland

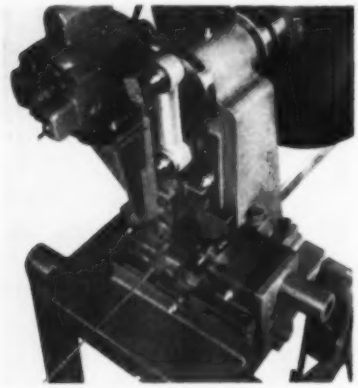
**OHIO**
American Malleable Castings Co., Marion
Canton Malleable Iron Co., Canton 5
Central Fdry. Div., Gen. Motors, Defiance
Dayton Mall. Iron Co., Ironton Div., Ironton
Dayton Mall. Iron Co., Ohio Mall Div., Columbus 16
Maumee Malleable Castings Co., Toledo 5
National Mall. and Steel Castings Co., Cleveland 6

**PENNSYLVANIA**
Buck Iron Company, Inc., Philadelphia 22
Erie Malleable Iron Co., Erie
Lancaster Malleable Castings Co., Lancaster
Lehigh Foundries Company, Easton
Meadville Malleable Iron Co., Meadville
Pennsylvania Malleable Iron Corp., Lancaster

**TEXAS**
Texas Foundries, Inc., Lufkin

**WEST VIRGINIA**
West Virginia Mall. Iron Co., Point Pleasant

**WISCONSIN**
Badger Malleable & Mfg. Co., S. Milwaukee
Belle City Malleable Iron Co., Racine
Chain Belt Company, Milwaukee 1
Federal Malleable Company, West Allis 14
Kirsh Foundry Inc., Beaver Dam
Lakeside Malleable Castings Co., Racine
Milwaukee Malleable & Grey Iron Works, Milwaukee 46



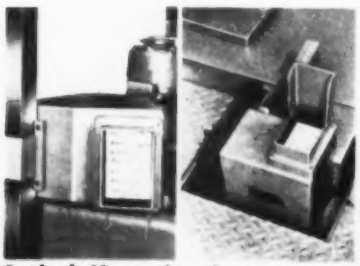
## High-Speed Tube Cutter Produces Burrless Tubing

Model 500 produces up to 235 pieces of tubing per minute, without burrs, ready for flaring. Machine will handle pieces as short as 1½ in. and holds this length to ± 0.005 in. with parallel faces.

Unit is designed to cut tubing from ⅛-in. dia having a 0.028-in. max wall thickness to ½-in. dia tubing having a 0.060-in. max wall thickness. In manual operation, tubing is hand-fed through radius cutoff blocks to a positive-length stop. Operator starts the cutoff cycle by depressing a foot-operated control. Cutoff holding blocks automatically close in on the tubing, holding it rigid and positively positioned. Specially designed shearing knives cut the material. Holding block automatically release as soon as knives complete their cut. Machine bed can be tilted backward to allow parts to fall directly into tote pans. Price of the cutter, less tooling, is $2245 fob.

*Novi Tool & Machine Co, 25806 Novi Rd, Novi, Mich*

MORE DATA? Circle 72, inside back cover



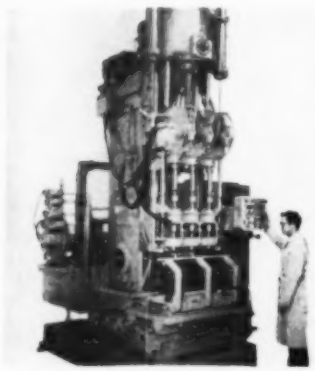
## Optical Measuring System Developed for Boring Mills

Optical measuring system, called Tele-Vernier, is designed to increase the accuracy and speed of reading vernier scales for vertical and horizontal movements of a boring mill.

The image of the long stainless steel scale, graduated to 1/40-in., is projected on a ground glass about 3 by 5 in. Vernier scale is etched on the screen and has 25 graduations. About 0.6 in. of scale is projected.

*Cincinnati Gilbert Machine Tool Co, 5366 Beekman St, Cincinnati 23, Ohio*

MORE DATA? Circle 73, inside back cover



## Multi-spindle Honing Machine Features Individual Hone Feed

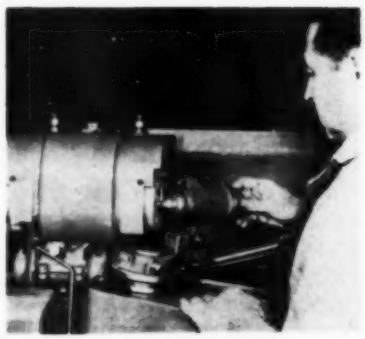
This Barndril Model No. 4014 three-spindle vertical honing machine has individually controlled pneumatic hone feed for each spindle, making it possible to compensate for varying operating conditions caused by bore size irregularities and different degrees of stock hardness.

The improved hone feed is said to result in shorter cycle time, improved bore conditions, and reduced stone wear.

The machine illustrated is used to remove 0.003 stock from fine bored cylinder walls of 6-cylinder cast iron blocks. Finish requirements are 25-35 rms. Production is 32 blocks per hour at 80% efficiency.

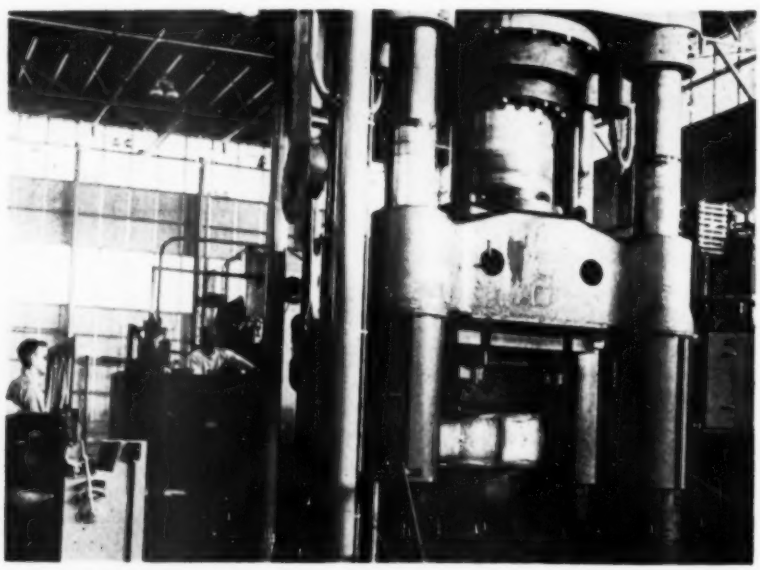
*Barnes Drill Co, 830 Chestnut St, Rockford, Ill*

MORE DATA? Circle 74, inside back cover



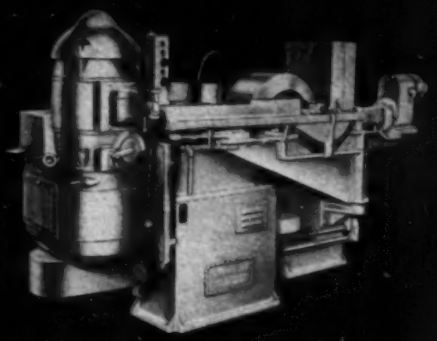
## Machine Grinds Elliptical Tip And True Radius Tip Tools

Sharpening machine for metal cutting tools is offered in two designs, Model 3 for conventional elliptical



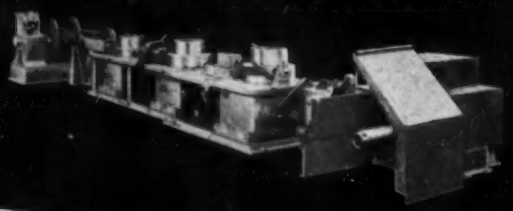
SUPERALLOYS ARE FORGED on this 2000-ton hydraulic press which makes squares and slabs out of round cobalt and nickel-base alloy ingots. Press is in use at Haynes Stellite's new facility designed to process ingots ranging from 1.5 to 5 tons—*Birdsboro Steel Foundry and Machine Co, 1941 Furnace St, Birdsboro, Penna*

MORE DATA? Circle 75, inside back cover



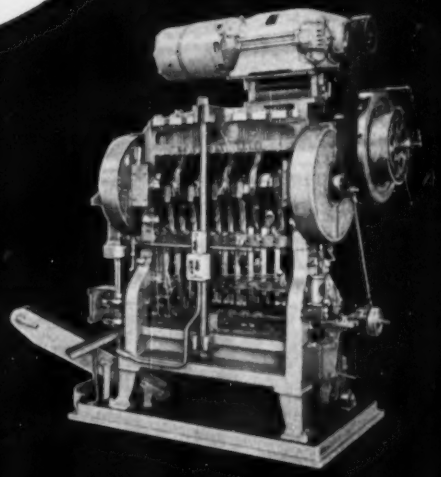
COLD HEADING
MACHINERY

EYELET, SLITTER
& WIRE
MACHINERY

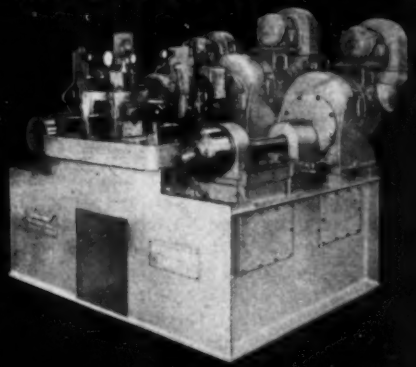


WATERBURY
MACHINERY BUILDERS
FARREL

POWER
PRESSES



ROLLING MILL
MACHINERY



THE WATERBURY FARREL FOUNDRY & MACHINE CO.
DIVISION OF TEXTRON INC.
Waterbury, Connecticut • U.S.A.
Sales Offices: Chicago • Cleveland • Los Angeles • Millburn, N. J.

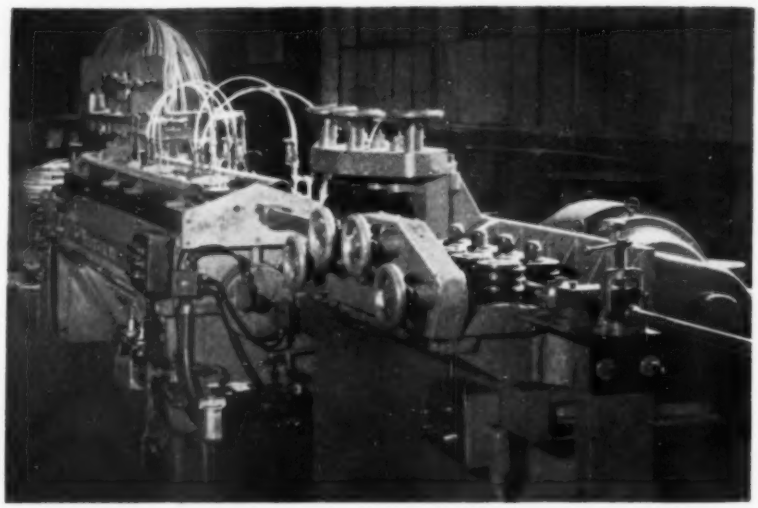
tip tool grinding and Model 4 for either elliptical or true radius tip grinding.

Fully automatic reciprocation assures uniform and repetitive tool tip accuracy and permits one operator to tend several machines at the same time. An offhand grinding attachment is standard equipment on both models.

Basic machines are priced at $4125 for the Model 4, and $2900 for the Model 3.

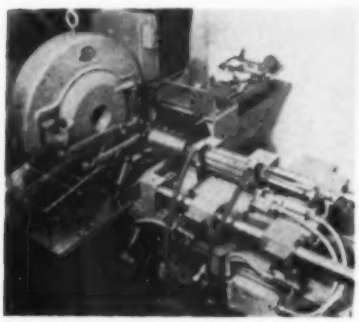
*Heald Machine Co, 8 New Bond St, Worcester 6, Mass*

MORE DATA? Circle 76, inside back cover



**AUTOMATIC PROCESSING LINE** cold draws, straightens, cuts and polishes bars from coiled rod at a rate of 200 fpm in a variety of shapes in sizes from 3/16 to 3/8 in. The line consists of an uncoiler, a pre-straightener, a draw-bench and roller straightener (illustrated), a flying cut-off, a polishing machine, and a discharge table—*Loma Machine Mfg Co, Inc, 114 E 32nd St, NY 16, NY*

MORE DATA? Circle 78, inside back cover

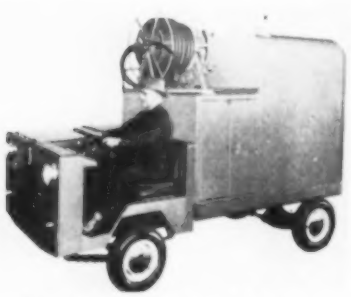


## Feed Attachment Increases Swaging Machine Efficiency

Automatic feeder and unloading attachment for swaging machines is claimed to provide the nearest thing to automation in swaging. Operator places pieces to be swaged on a feeding rack and then each piece is gravity loaded into the feeding mechanism where it is automatically gripped and fed into the swager. After swaging, it is retracted and the piece automatically rejected, while another piece is fed into the machine.

*Fenn Mfg Co, Newington, Conn*

MORE DATA? Circle 77, inside back cover



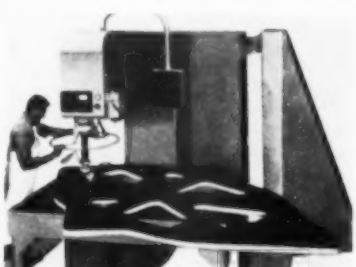
## Mobile Unit Blends and Meters Coolant to Machine Tools

Mobile tank unit, called a Coolant Servicer, blends and meters a variety of soluable oils and water directly to the machine tool in two to three minutes.

Servicer carries four oil tanks of 50 gallons each, a 300-gal water tank, and 50 ft of 1-in. hose. It is powered by a 72-hp liquid cooled engine and measures 144 in. long by 58 in. wide.

*Gorske Industrial Equipment, 132 E 30th St, Indianapolis, Ind*

MORE DATA? Circle 79, inside back cover



## Articulated Band Machine Has Increased Cutting Capacity

Pan-Arm Model 5 is a 4-speed variable drive band machine, (*AM*—Feb 25 '57, p188), with 21 in. work thickness and 60 in. throat depth, swung on anti-friction hinges to an intermediate arm, and through that arm by another set of hinges to a floor-mounted pedestal. This unique construction provides over 99 sq ft of cutting area and continuous straight-cut length of 17½ ft.

The machine has a tool speed range from 25 to 5000 fpm. This permits saw bands from ¼ to 1 in. wide for efficient cutting of material from free-machining to very tough.

*DoAll Co, Des Plaines, Ill*

MORE DATA? Circle 80, inside back cover

## 200-amp Heliarc Torch Is Less Than 7 in. Long

Heliarc HW-20 is small enough to weld inside a 3-in. tube, operates at 200 amps on continuous duty cycles, up to 225 amps on reduced duty cycles. Unit weighs 3.6 oz, is 6⅞ in. long, and is equipped with small, flexible service lines.

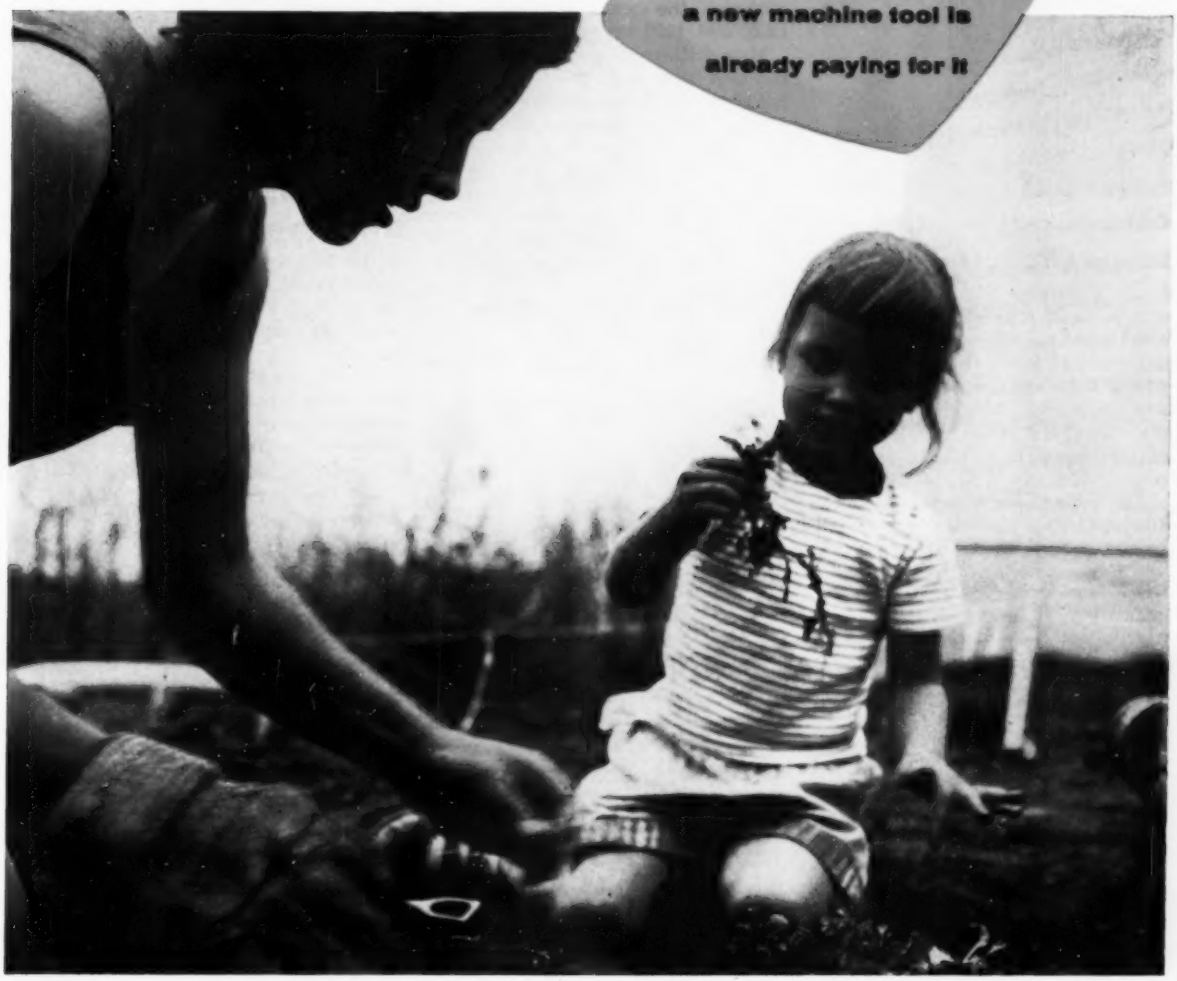
Additional features include a leak-proof water cooling system, efficient shielding to save gas, high frequency safety, all couplings standards IAA connections. Argon gas shutoff valve for mounting on the handle is available as an accessory.

*Linde Co, Div of Union Carbide Corp, 30 E 42nd St, New York 17, NY*

MORE DATA? Circle 81, inside back cover

JONES & LAMSON
MACHINE COMPANY

the man who needs
a new machine tool is
already paying for it



## Spring planting...1949

Just ten short years ago, but a lot of changes have taken place.

Except for Mother, who is every bit as attractive, nothing has remained the same. The garden is now long-established and flourishing, and Daughter is entering college in the fall.

In Dad's shop, things are quite different, too. Labor rates, prices of raw materials and overhead have kept climbing constantly.

Those once-new machines are still running O.K., and seem to have plenty of usefulness left in them. The big hitch, though, is that their performance standards were based on the costs of *ten years ago*. With today's increased costs, the *profitability* of these machines is in serious doubt.

The cost analyses Dad is now completing show very clearly that successful production under *today's* conditions requires *modern* equipment. He used J & L's new "Avoidable Costs" Replacement Formula. It's simple, clear cut and realistic, and avoids the fallacies found in other replacement formulas.

Write for your copy.

Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

## Custom-Designed Press Coins Sintered Metallic Compacts

Primary purpose of this 1000-ton hydraulic press is single-action coining of sintered metallic compacts which require extremely high unit pressures. Each compact to be processed is of a delicate size and shape demanding very close machining tolerances as well as highly sensitive control features.

An intermediate moving platen (die holder) hydraulically actuated, is incorporated in the design to provide for straight-through ejection of the coined compact. Platen can be adapted to serve as a second, or floating platen, normally required for double-action pressing of powder metals. Equipment is design-engineered for either fully automatic or semi-automatic cycling. Selector switch is included for choosing a jog type operation for setup work.

*American Steel Foundries, Elmes Engineering Div, 1150-A Tennessee Ave, Cincinnati 29, Ohio*

MORE DATA? Circle 82, inside back cover

## 15-in. Heavy-Duty Drillpress Has Variable Speed Selector

Model 1100 incorporates the Quik-Set spindle speed selector that permits instant speed settings of from 600 to 4800 rpm on the high speed model and from 450 to 2800 on the slow speed model. Speeds can be changed while the drillpress is running. Unit is also available in step-pulley models. The high speed model can be set for 680, 1250, 2400, and 4600 rpm; the slow speed at 470, 780, 1300, and 1950 rpm.

Max drilling diameters are ½ in. for cast iron and ⅜ in. for steel. Standard (vertical adjustment only), tilting and production tables are available as well as floor and bench models. Quill diameter is 2-3/16 in.; key chuck range, 0 to ½ in. Stroke is 4¾ in. with table work surfaces of 10 x 11 in. (tilting) and 12 x 18 in. (production). Base working surface is 8½ x 12 in.

*Powermatic Machine Co, McMinnville, Tenn*

MORE DATA? Circle 83, inside back cover

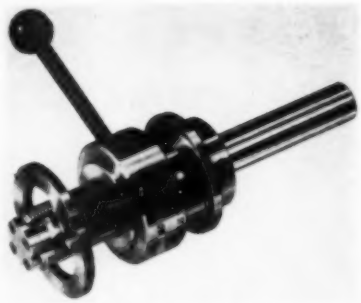
## Adjustable Blade Facing Head Plunge Faces Wide Surfaces

Microface, latest addition to the DeVlieg Microbore tooling system, eliminates need for special tooling to bore, face, or spotface wide surfaces. Dovetail principle of mounting maintains consistently accurate positioning of the blade holder throughout its range of adjustment in order that the cutting edge of the blade remains square to the center line at all times. Interchangeable HSS or carbide blades may be replaced right on the machine.

Five sizes of standard Microface heads are available to machine diameters from 1½ to 8½-in. sizes. Also available are a series of adapters with shanks to suit all types of horizontal, vertical, and precision boring machines, jig borers, turret lathes, and heavy drilling equipment.

*DeVlieg Machine Co, Microbore Div, Fair St, Royal Oak, Mich*

MORE DATA? Circle 84, inside back cover



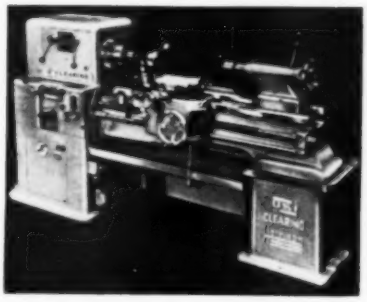
## Collapsing Taps Designed for Work On Especially Tough Materials

Series of new Class ST is similar to company's Class S collapsing taps except that they have a semi-taper action for tapping NPT or NPTF pipe threads.

Semi-taper mechanism permits the chasers to recede during the tripping action, greatly reducing the cutting stress as the full threads are being formed. It also completely eliminates the stop-off lines usually left by jam-cut tapping. The thread is produced with this tap by the jam-cut principle up to the point of tripping after which the semi-taper mechanism functions just before collapsing the chasers. Positive adjusting screws in the trip bars prevent any movement during tapping. Class ST can be purchased in all sizes of the Class S series; general dimensions are the same, and they use standard Class S chasers.

*Geometric-Horton, New Haven 15, Conn*

MORE DATA? Circle 85, inside back cover

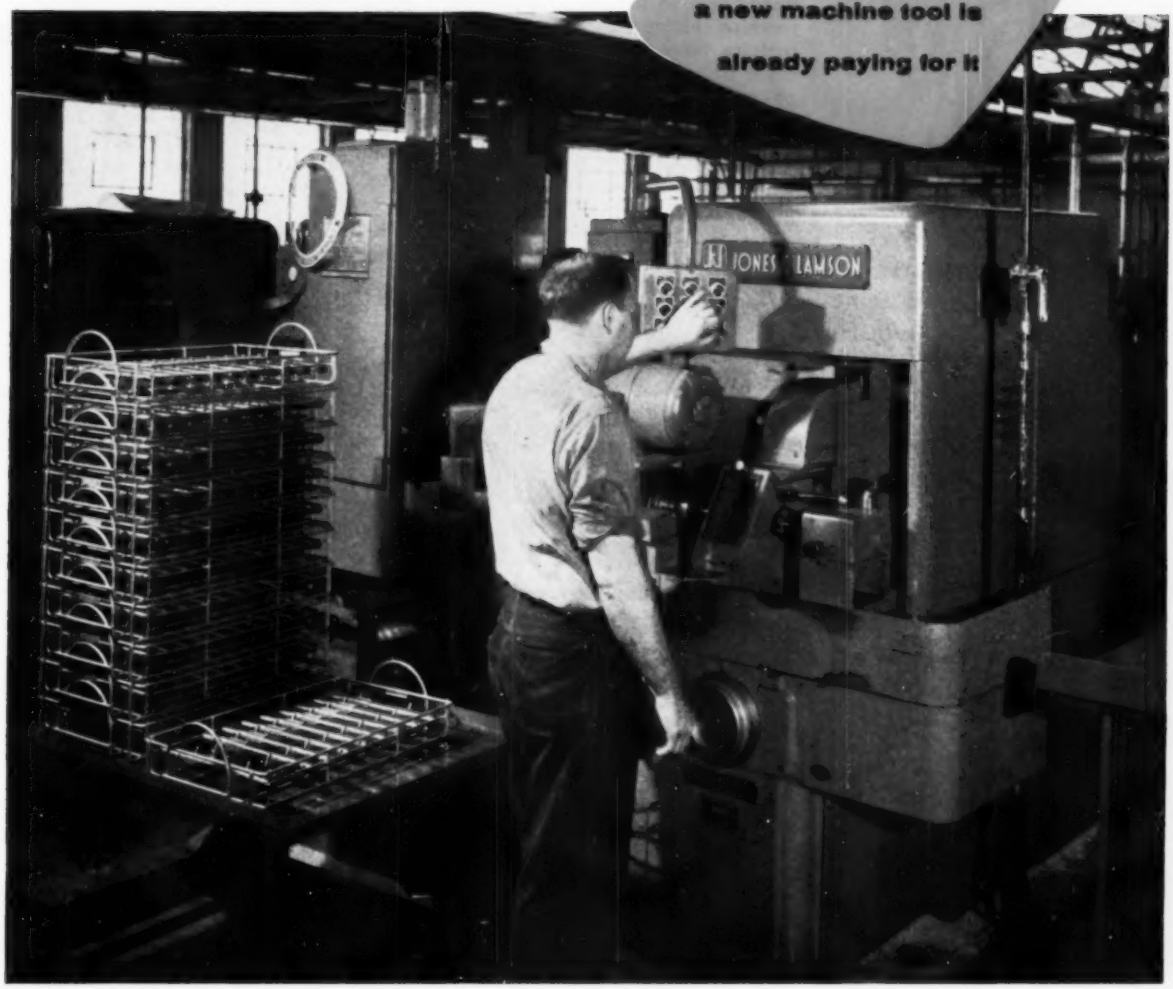


ENGLISH LATHES, manufactured to US specifications by T J Harrison and Sons, Ltd, will be marketed here by the Clearing Division of US Industries, under the name Clearing-Harrison. The lathes range in size from 11 to 16 in. and are said to cost 30% less than comparable American lathes—*Clearing Machine Corp, Div of US Industries, Inc, 6499 W 65th St, Chicago 38, Ill*

MORE DATA? Circle 86, inside back cover

JONES & LAMSON
FORM GRINDERS

the man who needs
a new machine tool is
already paying for it




## Rapid, precise form grinding with PFC keeps outboard motor production at full throttle

The new V-type construction of Evinrude's smooth-running outboard motors is giving power-packed pleasure to boat owners.

In the initial stages of production, however, this new motor posed new, tough manufacturing problems for Evinrude production men.

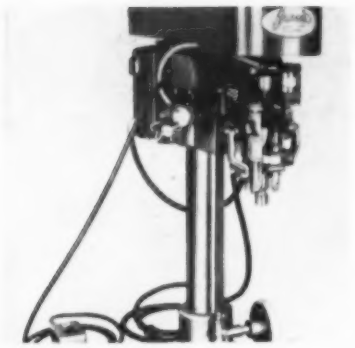
For example: the prime moving parts of this balanced outboard design are short, rigid crankshafts. The pins of these crankshafts had to be ground to .0005″ tolerances on diameter, and to .0001″ taper on the length of the pin. Required production: 110 pieces per hour.

J & L Model E Form Grinders proved to be a key factor in meeting these rigid production requirements while maintaining highest quality standards.

In another Model E application on the same motor, two grooves are formed from the solid in stainless steel propeller shafts at a rate of 146 parts per hour (illustrated). There is *no time out for wheel dressing*, because this machine is equipped with PFC (Perpetual Form Control).

This sort of grinding efficiency can keep *your* production roaring at full throttle, too. Write for detailed information. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools



## Adjustable Pitch Lead Screw Tapper Is Completely Automatic

Adjustable pitch lead screw tapper is completely automatic, using air and electrical controls, and can be connected with the controls of an indexing table. Tap depth is electrically controlled and can be set to any depth with the stroke of the lead screw unit, which can rapidly be converted from one pitch to another.

Adaptable to any drill press table, the unit is furnished in five standard models and has four speed pulleys, providing speeds of 575, 958, 1437, and 2415 rpm.

*Jarvis Corp, Middletown, Conn*

MORE DATA? Circle 87, inside back cover

## Jewelled Vee Drill Machine Simplifies Micro Drilling

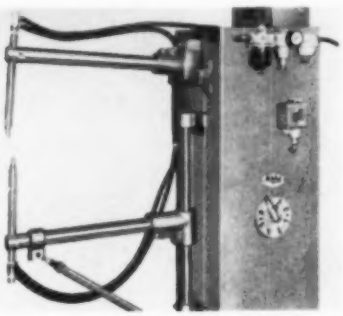
Najet No. 7A is designed for drilling holes from 0.001 in. to 0.015 in. dia and is capable of drilling holes in steel as small as 0.00025 in. dia.

It is claimed that construction absolutely eliminates vibration, drill runout, spindle and bearing tolerance, and lost motion in the leverage system. Each drill is its own spindle and rotates in open-jewelled V's. Pivot-mounted leverage system reduces friction and gives magnified control and sensitivity to the operator. Optical equipment provides provides proportionate stereoscopic visual magnification.

Power unit is a remote 1/40-hp motor which reduces vibration to a minimum. Drilling machine has a one-step precision machined pulley and the remote motor has a three-step pulley. A 16 to 18-in. nylon thread is used to rotate the drilling machine pulley. This arrangement permits three spindle speeds; machine pulley used with large motor pulley, 4959 rpm; medium motor pulley, 3500 rpm; small motor pulley, 2500 rpm.

*Distributed by Carl Hirschmann Co, 30 Park Ave, Manhasset, NY*

MORE DATA? Circle 88, inside back cover



## Air-Operated Rocker Arm Welder Offered in 7½-75 kva Capacities

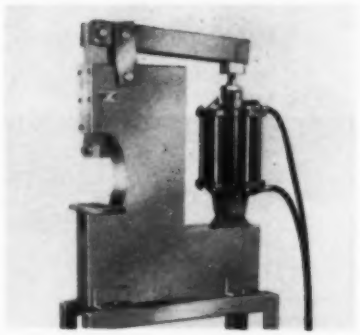
Air-operated rocker arm type welder is offered in capacities from 7½ to 75 kva. Unit is completely water cooled. Standard model has a maximum spacing of 12 in. between the arms with special models available for 48 in. throat depth and adjustable lower swivel arm having a maximum spacing of 28 in. between the arms. Timer and contactor are optional features.

*Alphil Spot Welder Mfg Corp, 1058 Pacific St, Brooklyn, NY*

MORE DATA? Circle 89, inside back cover

CHIP COLLECTION SYSTEM is fastened to machine where chips are formed and picks up waste automatically. Nozzle for operators use is illustrated above—*Lamson Corp, Syracuse 1, NY*

MORE DATA? Circle 90, inside back cover



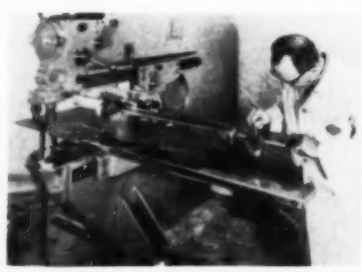
## Machine Has 6½-Ton Capacity For Notching, Shearing, Punching

The Little Blacksmith No. 56 is a 6½-ton capacity pneumatic machine that can be used for notching, shearing, or punching operations.

It can cut a 90° 2½ by 2½-in. notch in 3/16-in. mild steel, notch or cut off 2 by 2 by 3/16-in. angle, shear 3 by 3/16-in. bars, punch holes up to 2 in., depending on thickness of material. It operates on 100-psi air line pressure, weighs 225 lbs, costs $396.

*J F Kidder Mfg Co, Inc, 426 Colchester Ave, Burlington, Vt*

MORE DATA? Circle 91, inside back cover



## Trumpf Copy Nibbling Machines Work Directly From Templet

Nibblers that will reproduce blanks or cut-outs of any shape directly from a master or templet will also perform shearing, beading, folding, flanging, peening, and slotting operations.

Sheet is rigidly clamped to roller bearing-guided coordinates which permit it to be moved effortlessly in any horizontal direction by guiding a tracer pin along the contours of the templet. Separate punching or drilling of the sheet is eliminated since the all-side cutting punch is designed to pierce the starting hole. Rectangular cut-outs do not require a master; they are positioned directly by built-in rulers. Circular cuts from ⅜ to 24-in. dia can be produced by clamping the tracer guiding pin into a revolving, adjustable ruler.

# JONES & LAMSON 180° TRACER

the man who needs a new machine tool is already paying for it

## Does more work in one chucking... reduces off-machine time

The new J & L Two-Dimensional Turret Lathe Tracer cuts costs to the bone, by reducing handling time and all the wasted effort that goes along with it.

In addition to all of the versatility and accuracy of the standard J & L turret lathe, this equipment offers four completely automatic tracing cycles, each of which gives tool travel control of more than 180°.

For instance, you can rough out a part with conventional turret lathe tooling, then trace through 180° of turning or boring, and 180° of facing — *all in one chucking.*

A single flat template can 1. Combine all contours for boring, turning and facing. 2. Accommodate the transition between tracer turning and tracer facing. 3. Permit automatic relief and return of the respective tracing tools.

Tooling mounted at the rear and front of the cross slide not only allows for rough and finish tracing with the appropriate tool, but also offers the potential of multiple tooling tracing operations through more than 180° of contour. *This* is true machining flexibility.

Write for folder No. 5903.

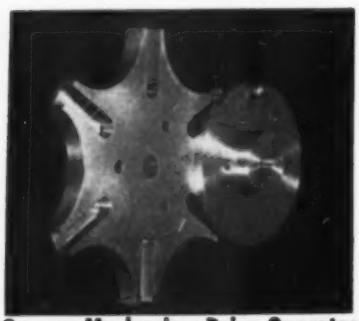
Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Machines are available with throat depths of 41, 49, and 59 in. Cutting capacity is up to 9-gage steel material of 70,000-psi tensile strength.

*Imported by Cosa Corp, 405 Lexington Ave, New York 17, NY*

MORE DATA? Circle 92, inside back cover



## Geneva Mechanism Drive Operates At 2000 Indexes Per Minute

External geneva motions known as Tangen Drives convert rotary to indexing motion and operate at speeds up to 2000 indexes per minute, according to the manufacturer.

The drives are available in any center distance from 1 to 24 in. and to index any given number of stations. They index without knocking, and locking after each index is accurate within 0.001 in.

*Geneva Motions Corp, 111½ N E Cleveland St, Clearwater, Fla*

MORE DATA? Circle 93, inside back cover

## TIG Welder Can Also Be Used For Metallic Arc Welding

New model Idealarc is available in the NEMA rated 300-amp size either as a straight ac transformer welder or as a combination ac and dc rectifier welder. Unit has a saturable reactor type control. Electrical circuitry and construction are designed to provide an advanced, sinusoidal type output current characteristic. This is said to give the arc max cleaning effect on aluminum and permits faster welding speeds in addition to providing exceptional arc characteristics with manual electrodes.

Prices for the new machine start at $360 for the basic ac welder and $625 for the basic ac/dc model.

*Lincoln Electric Co, Cleveland 17, Ohio*

MORE DATA? Circle 94, inside back cover

## Electric Low-Headroom Hoists Available in 1½-7½ Ton Range

Line of electric low-headroom hoists is available in capacities from 1½ to 7½ tons. The 5-ton model, for example, requires only 24 in. of headroom.

The hoists are powered by a 7½-hp, 30 minute, 55 C rise, totally-enclosed motor with weatherproof brake of the multiple-disk type. A 4-position weight operated limit switch protects the hoist and the operator. Motor driven trolleys can be supplied in single speed, variable speed, and fluid drive designs, with speeds from 30 to 150 fpm.

*Robbins and Myers, Inc, Hoist and Crane Div, Springfield, Ohio*

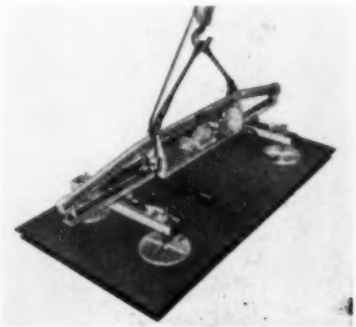
MORE DATA? Circle 95, inside back cover

## Airetool Introduces Line Of Pneumatic Nutsetters

Line of pneumatic nutsetters consists of four models—reversible and non-reversible types with straight or pistol grips. All models are available with adjustable clutch, positive clutch, or direct drive, and in one of four operating speeds. Recommended working air pressure is 90-100 psi.

*Airetool Mfg Co, Springfield, Ohio*

MORE DATA? Circle 96, inside back cover



## Vacuum Grapple Available In 500-4000-lb Capacities

Designed for operation with all types of cranes, this self-contained vacuum grapple is available in four standard models with lifting capacities ranging from 500 to 4000 lbs.

The unit consists of a tubular cross-member which also acts as a vacuum reservoir, an integral vacuum pump and motor, and adjustable cup arms. Each of the two arms carries two adjustable vacuum cups.

Interlocked controls include a safe-to-lift light to indicate adequate vacuum. To release the load there is a push-button solenoid valve which cuts off vacuum supply.

*Noble Co, 1860 7th St, Oakland, Calif*

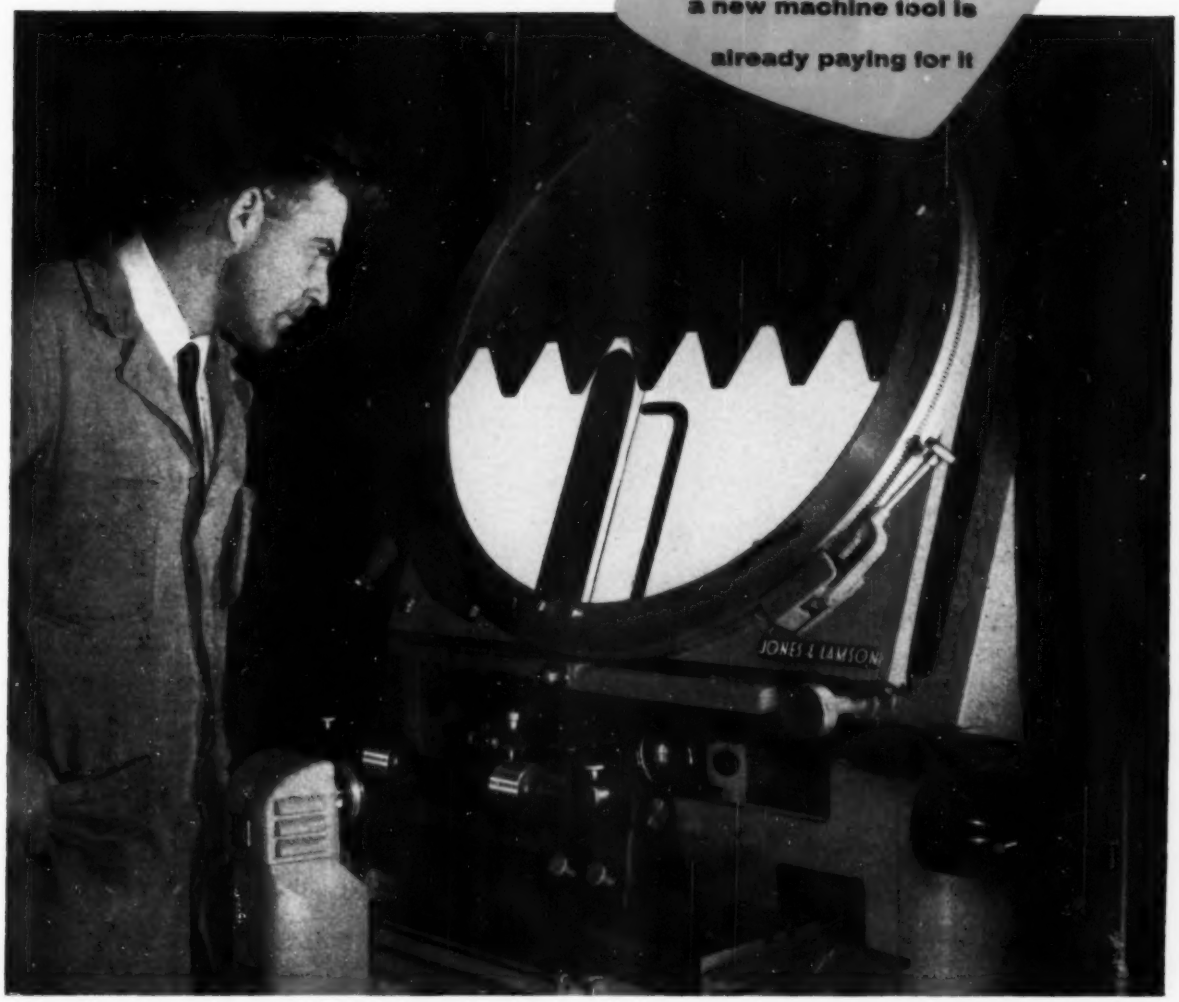
MORE DATA? Circle 97, inside back cover

REVERSING TAPPING ATTACHMENT, SAR-100, features easily hand-adjusted torque clutch, no forces on tap when over-running clutch is disengaged, and friction free axial movement, using tap itself as leadscrew—*Homestrand, Inc, Larchmont, NY*

MORE DATA? Circle 98, inside back cover

# JONES & LAMSON OPTICAL COMPARATORS

**the man who needs a new machine tool is already paying for it**




## Determines lead and spacing errors of less than .0001"

Lead amplification on J & L Comparators combines both optical and mechanical magnification in standard gaging set-up. It produces amplification of any lead error, in threads of all standard forms and pitches.

For example, a .0001" lead error is magnified to .050" or .100" on the screen. Measurements are made direct on the machine's micrometer, with ease and repeatability.

Other demanding applications, such as the extremely precise measurement of critical spacing between the valve ports and the piston lands of hydraulic valves, are also performed with this new amplifier.

The dependability of this attachment was demonstrated in a series of tests conducted on a special application by J & L engineers. Among other things, it was proved beyond doubt that a group of Jo blocks can be measured within .000025". Furthermore, these readings were easily repeated, even by different operators.

The speed, precision, flexibility and dependability of Jones & Lamson Comparators might well make a big difference in *your* operations. Write for Catalog 5700, Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

introducing a

# NEW

# OLOFSSON

## HEAVY DUTY PRECISION BORING MACHINE

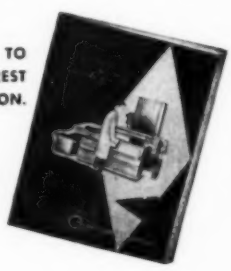
**Designed for better precision finishing...semi-finishing...and roughing of large, bulky parts**

This newest in the line of Olofsson Precision Boring Machines, the Model 22, is designed for more profitable heavy-duty rough and finishing boring, facing, chamfering, turning and grooving operations. Put one to work . . . and profit potential goes up. Because of the versatility of its new design, operating costs go down.

MODERN, WITH 22 QUALITY-DESIGN FEATURES, the Olofsson Model 22, weighs a hefty 7,600 lbs., untooled; and incorporates such design features as:

- *Extremely low ratio, height to width, of spindles to ways.*
- *Hardened and ground Alloy Steel flat and vee ways.*
- *Extra-large fixture mounting provides maximum stability for mounting large work pieces.*
- *Integral chip chutes completely surround any fixture tooling.*

**WHATEVER YOUR PRODUCTION REQUIREMENTS, IT WILL PAY YOU TO FULLY INVESTIGATE THE MODEL 22. CONTACT YOUR NEAREST OLOFSSON REPRESENTATIVE. Or, if you prefer, write direct to OLOFSSON.**



THE OLOFSSON

2728 LYONS AVENUE, LANSING, MICH. *Phone:* IV anhoe 4-5381

*MANUFACTURERS OF PRECISION BORING AND SPECIAL MACHINERY*

CIRCLE 293 READER SERVICE CARD

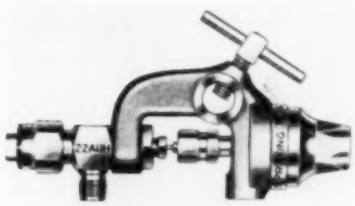
## Pneumatic-Hydraulic Fastening Tool Has Longer Work Stroke

Pneumatic-hydraulic fastening tool, of the pull-action type, features a longer work stroke for quicker fastener installation. Designated the Model 200 Pneu-Hydra Tool, it operates on compressed air which is converted to hydraulic power by an integral power intensifier.

When operating at 90 psi air pressure, it is capable of installing all blind rivets and similar fasteners requiring up to 3000-lb installation force. Tool weighs 10 lbs and its working stroke is 1¼ in., long enough to complete the fastener installation in a single reciprocation.

*Huck Mfg Co, 2480 Bellevue Ave, Detroit 7, Mich*

MORE DATA? Circle 99, inside back cover



## Automatic Spray Gun Features Wide Variety of Orifice Tips

The AutoJet spray gun is designed for airless paint spraying and coating with automatic production line equipment. It applies paints, lubricants, polishing and buffing compounds, and similar industrial substances at pressures from 400 to 2,000 psi. The pneumatically operated control valve operates at 70-100 lbs pressure.

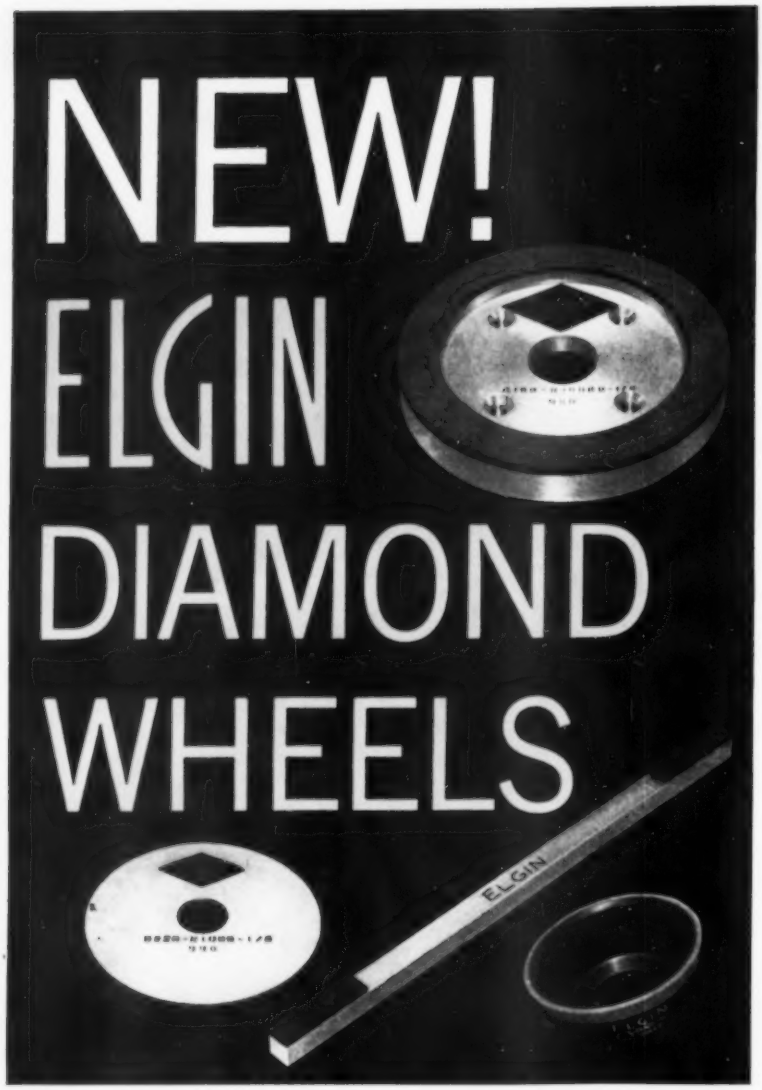
There is an unusually wide choice of interchangeable orifice tip sizes and materials. Tips can be supplied in stainless steel, hardened stainless steel, chrome plated brass, and chrome plated with tungsten carbide inserts.

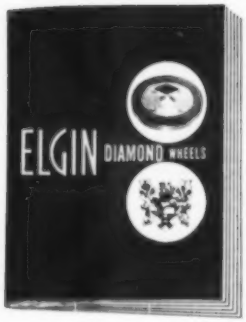
*Spraying Systems Co, 3201 Randolph St, Bellwood, Ill*

MORE DATA? Circle 100, inside back cover

CUT TIME! CUT COSTS!
CUT ALMOST ANYTHING
IN SECONDS!
No. 20 Manual-Operated Model
No. 14 Power-Operated Model
Speed Cut
Abrasive Cutting Machines-MANUAL OR POWER-OPERATED MODELS FOR WET, DRY OR ANY-ANGLE CUTTING!
Speed Cut
Send for complete catalog and name of nearest distributor
ABRASIVE MACHINE DIV.
BEAVER PIPE TOOLS, INC.
DANA AVE.
WARREN, OHIO

# NEW! ELGIN DIAMOND WHEELS



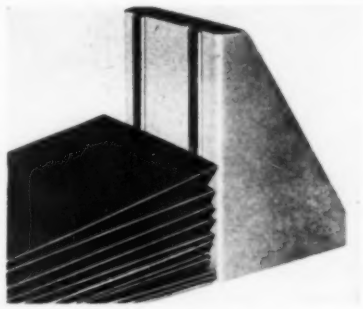




**Now – ELGIN offers you a complete line of Golden Circle Diamond Wheels with *guaranteed diamond content***

Diamond wheels—every shape, every size—resinoid, metal, or vitrified bonded—they're all available from Elgin! Guaranteed diamond content means more pieces ground per wheel, more return on your wheel-dollar. Consult an Elgin field engineer—his broad abrasives experience will help you select the right grit, wheel-shape, and bond—the wheel that will keep your grinding costs down. Our new diamond wheel catalog greatly simplifies ordering. Write for it today.

*Abrasives Division*
**ELGIN NATIONAL WATCH COMPANY**
ELGIN, ILLINOIS



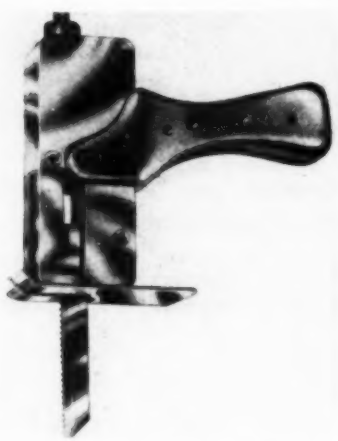
## Magnetic Sheet Fanner Increases Speed, Safety

A more powerful permanent magnet fanner makes the handling of sheet steel faster and safer, according to the manufacturer. It uses a recently developed oriented ceramic magnet material, Indox V, which has a stronger, more uniform magnetic field and high resistance to demagnetizing influences.

When steel sheets are stacked against the fanner, a magnetic field is induced in the sheets, making them repel each other and fan out. Handlers may remove single sheets quickly with less danger of injuring their hands. Fanner is said to offer more positive separation of dirty, oily sheets that tend to be sticky.

*Stearns Magnetic Products, 635 S 28th St, Milwaukee 46, Wis*

MORE DATA? Circle 101, inside back cover



DRILSAW for use on any ¼-hp portable drill or fixed drillpress works as a crosscut, rip, jig, coping, keyhole, or backsaw. It can handle aluminum, brass, or mild steel up to ⅜ in. thick. Holes can be started without predrilling the material. Price is $16.95—*Williams & Scott Co, Box 7429, Kansas City 16, Mo*

MORE DATA? Circle 102, inside back cover

# ON THE BALL

# 500,000

# TIMES A DAY BRIDGEPORT Free-Machining Brass Rod!

Because ball point pens are in everyday use, production of vital brass tips becomes astronomical along with quality control problems.

These tips – one of which is shown much enlarged – are produced at ultra-high speeds. The brass rod needed for them must be flawless in every respect. *Consistent* metallurgical composition, *precise* dimensional tolerances and *unvarying* standards of machinability – if any of these qualities vary even a fraction, production comes to a frequent and costly halt.

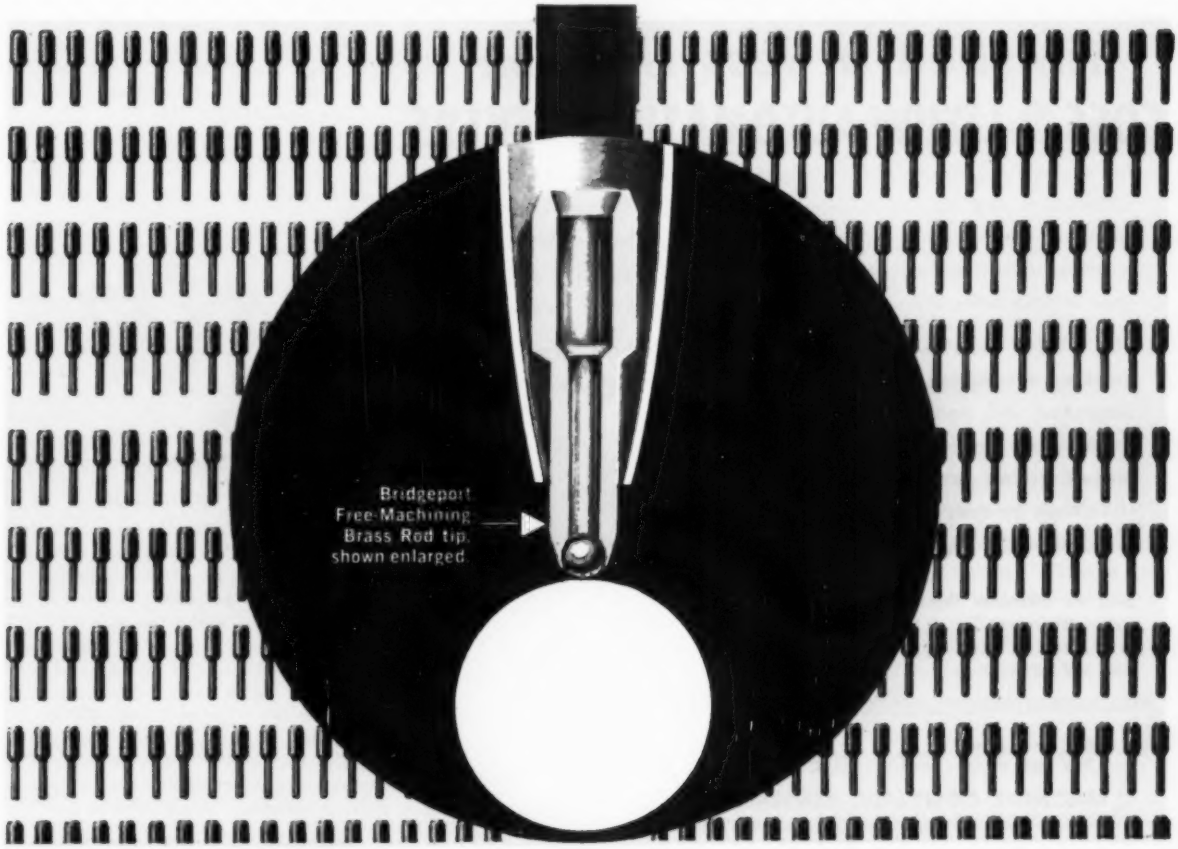
That's why Revere Metal Art Co., Inc., New York City, specifies Bridgeport Free-Machining Ball Point Pen Brass Rod for these inserts. It meets all requirements for precision, straightness, workability, machinability and tolerances – and, in addition, provides a surface finish that keeps finishing time and costs to a minimum.

Whether you use rod, strip or tube, you can count – just as Revere does – on getting consistent quality every time you specify Bridgeport Brass Alloys. It will pay you to get the complete story. Call your nearest Bridgeport Sales Office or write us direct for a complete list of Bridgeport products – Dept. 3005.

**BRIDGEPORT BRASS COMPANY**

BRIDGEPORT 2, CONNECTICUT

*Specialists in Metals from* **A***luminum to* **Z***irconium*



# More Pieces COMPLETELY *finished in less time on* GOSS & DeLEEUW AUTOMATIC CHUCKERS

This machine . . . already acknowledged and accepted as a metal-working achievement, and the only standard one of its kind . . . winds up a day's operation with all parts assigned to it completely finished and with no secondary operations necessary. When fully loaded, a complete piece is finished at each index circle. High productivity is attained with simple tooling.

**The "1-2-3" exclusive Goss & DeLeeuw feature provides for finishing machining three ends of a part simultaneously or in sequence. All operations are performed in a single set-up, and complete finishing done in much shorter time than by conventional methods.**

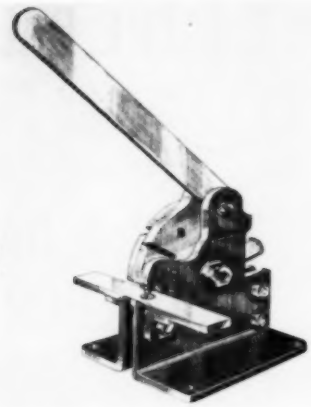
•

*Send for illustrated literature which fully describes this recent Goss & DeLeeuw development in chuckers. Submit samples of your work for time and cost estimates.*

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

**GOSS and DE LEEUW**
**MACHINE COMPANY, KENSINGTON, CONN., U.S.A.**



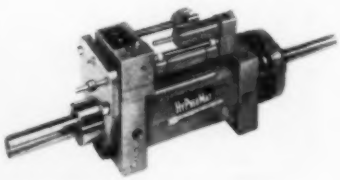



## Tool Punches, Shears, Forms and Rivets Metal

Unit punches burr-free holes in metals up to 16 gage to 1 in. from edge of stock. There are five round punch sizes: 1/8, 5/32, 3/16, 7/32, and ¼ in. Square, oval, and hexagon shaped punches are also available. Tool shears metals up to 16 gage thickness, to 1 in. wide, at any angle. It will also shear rod and wire. It forms metal with bends up to 90° using rod or bar stock up to 1 in. wide, 16 gage thick. Unit rivets with any type of solid or hollow rivet up to 1 in. from edge of stock and up to a max of ⅜ in. in total thickness. Price is $12.95.

*Albert J Tatu, Inc, Dept 87, 5473 Main St, Williamsville 21, NY*

MORE DATA? Circle 103, inside back cover



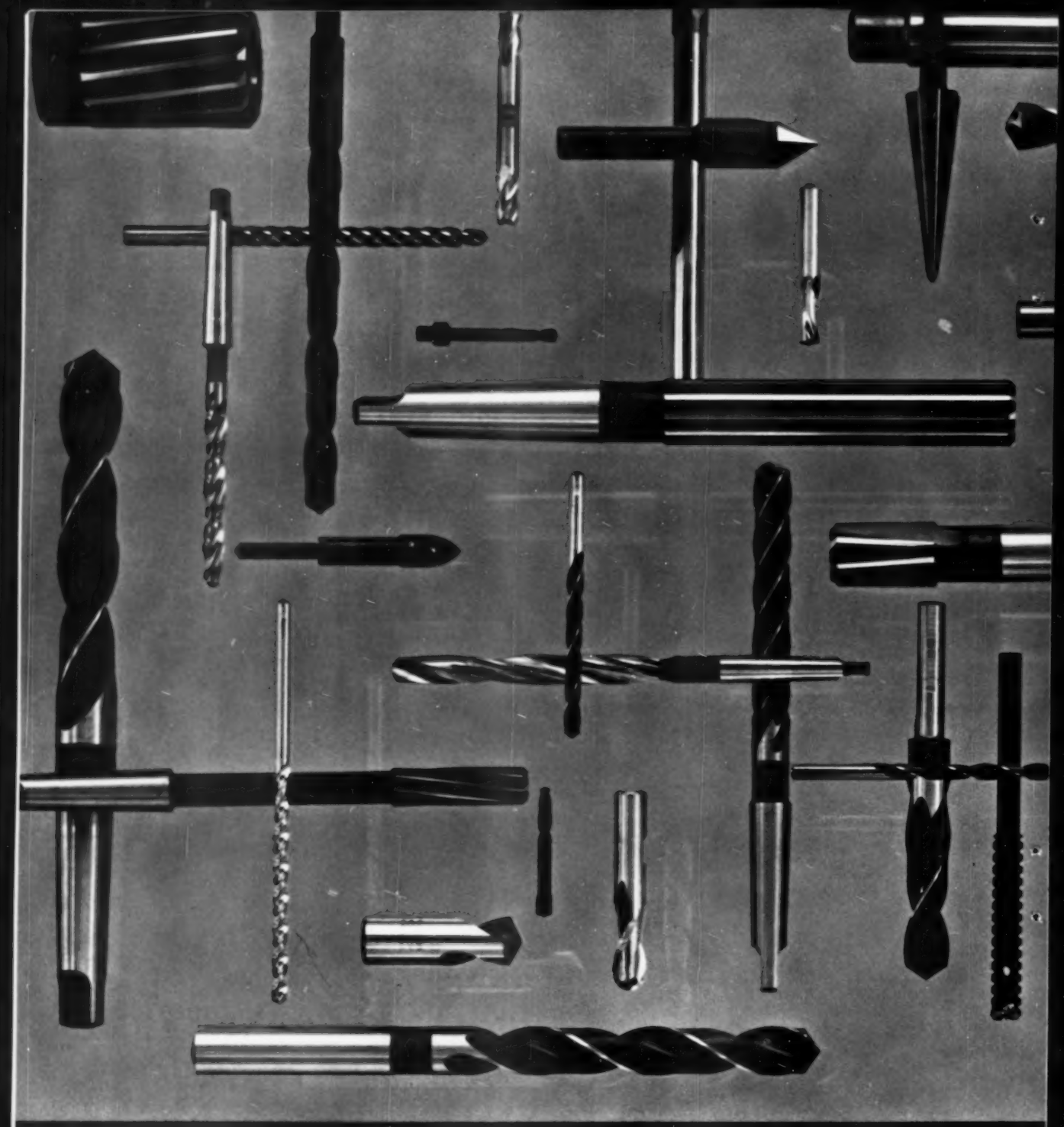
## Drilling and Tapping Units Have Strokes up to 25 in.

Heavy-duty units are manufactured in stroke lengths up to 25 in., lighter duty models in stroke lengths to 12 in. These automatic units can be easily interlocked with indexing tables, automatic work feeders and fixtures. Quill extension permits extremely close radial grouping and can be used for multi-spindle drilling and tapping as well as cavity drilling. More than 40 standard models are available.

*Hupneumat, Inc, Milwaukee, Wis*

MORE DATA? Circle 104, inside back cover

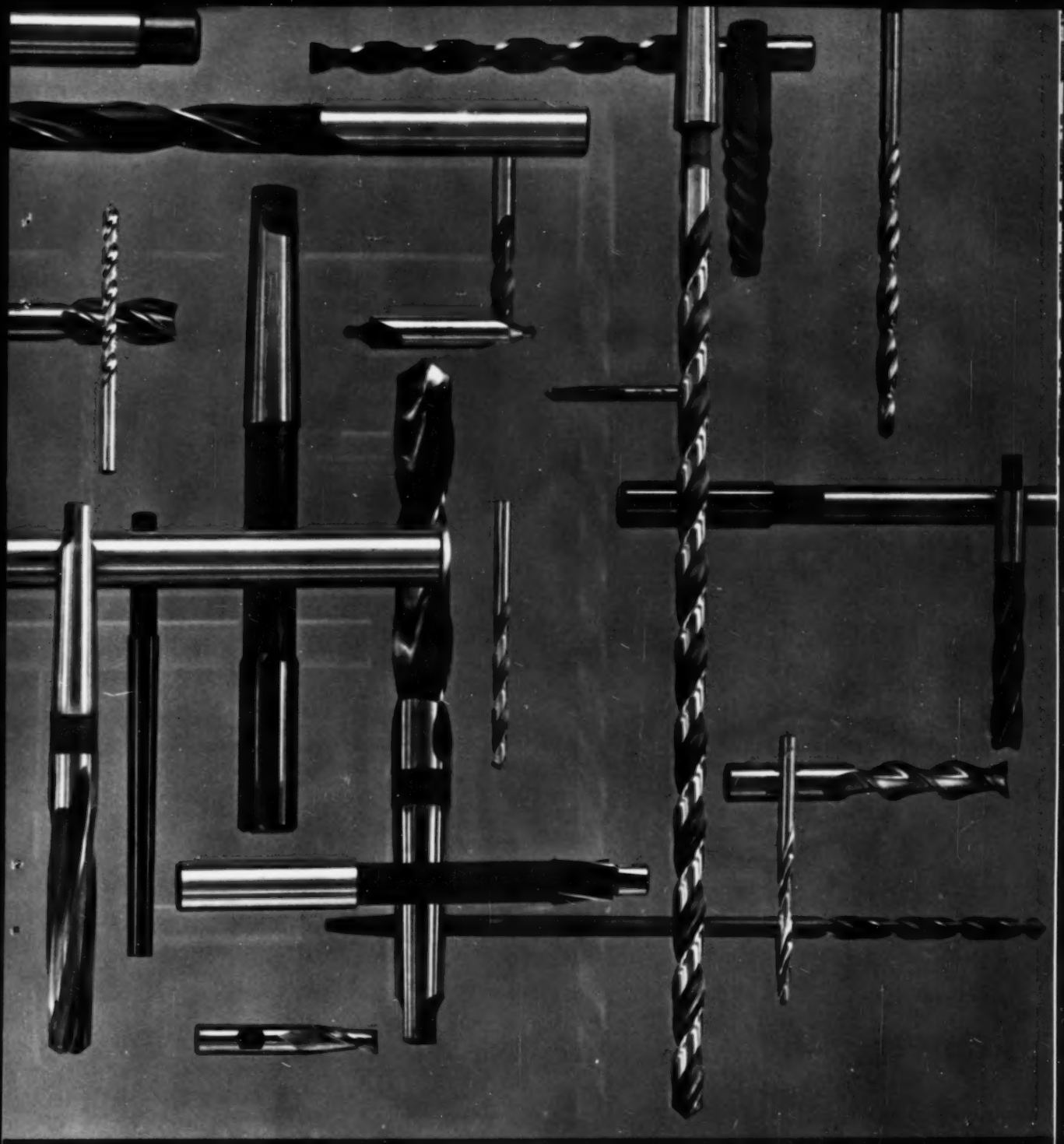
WHITMAN & BARNES Quality Cutting Tools
Produce More Every Hour... Every Day...
Every Hole At Lower Cost!
WHITMAN & BARNES
MAKERS OF FINE TOOLS SINCE 1841
DRILLS AND REAMERS
40000 PLYMOUTH ROAD • PLYMOUTH, MICHIGAN
NEW YORK CHICAGO LOS ANGELES



WHITMAN & BARNES Cutting Tools

Are More Than Product Lines . . . They're

Your Partners in Production Progress



In your constant fight against operating costs, the initial price of cutting tools is NOT your answer—realistic, long-range economy is! With an unequalled selection of application tested standard tools . . . with superior special tools . . . with the best in engineering and technical assistance . . . Whitman & Barnes guarantees to help you secure higher production, improved product quality AND lower production costs!

**W&B**

## HELP ON YOUR CUTTING TOOL PROBLEMS

111 years of experience in the manufacture of fine tools enables us to offer you the best in help for your cutting tool problems. W&B trained cutting tool specialists throughout the country stand ready to assist you with the best applications of standard W&B tools or in the designing of special tools to meet your unusual problems. Just write to W&B or request this service through your W&B distributor. Our representative will quickly contact you.

## SEND FOR FACTUAL CASE HISTORY BROCHURE

Actual companies . . . actual applications . . . actual problems. All are detailed in this free brochure. It provides on-the-production-line facts and figures as to how and why Whitman & Barnes cutting tools can effectively cut costs in a wide variety of applications and materials. Just fill in the coupon below for your free copy.

## SECURE IMMEDIATE, EFFICIENT SERVICE

Your local W&B Distributor stocks most standard types and sizes of W&B tools. He can give you fast delivery and the best in service. Give him a call today.

## SEND FOR YOUR NEW W&B CATALOG

The new Whitman & Barnes Catalog No. 108 is yours for the asking. Its 132 pages contain the latest standards and specifications together with complete technical information.

Just write to Whitman & Barnes on your company letterhead and we will be happy to send you a copy.

**WHITMAN & BARNES**

MAKERS OF FINE TOOLS SINCE 1845

**DRILLS AND REAMERS**

40000 PLYMOUTH ROAD • PLYMOUTH, MICHIGAN

NEW YORK CHICAGO LOS ANGELES

**Whitman & Barnes**
**Plymouth, Michigan**

☐ Please send me your free Case History Brochure.

☐ Please have a W&B representative call to discuss cutting tool problems. No obligation, of course.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

LITHO IN U.S.A.

## NEW SHOP EQUIPMENT

**Throw-away inserts** in a popular range of tungsten carbide grades and sizes are available with precision ground negative and positive rake and utility ground negative rake. Premium quality finishes are diamond lapped.

*Multi Metals Inc, 500 E Main St Louisville 2, Ky*

MORE DATA? Circle 105, inside back cover

**Insert driver** drives self-tapping or regular inserts to very accurate positions by using a wide-range depth gage on the driver while the driver is rotating. It can be used with a tapping head mounted on an ordinary drill press or with automatic air or electric tapping motors.

*Titan Tool Co, Main St, Fairview, Penna*

MORE DATA? Circle 106, inside back cover

**Test kit** for checking on what's happening chemically to neutral salt baths insures accurate control, prevents possible decarburization during neutral hardening, high speed preheat, or high speed speed hardening of costly alloy steels. Test readings show degree of bath breakdown from overheating, infiltration of sulphur or alkalies.

*A F Holden Co, 14341 Schaefer Highway-TR, Detroit 27, Mich*

MORE DATA? Circle 107, inside back cover

**Cooling agent** for abrasive cutting is reported to keep wheels sharp and clean, promote rapid chip settling, improve cut quality, minimize odors, be foam free, inhibit rusting of machines, retain full effectiveness for long periods of heavy production, and increase wheel life by 15 to 20% under certain operating conditions. Cost per gallon of mix ranges from 1.7 to 2.6 cents.

*Allison - Campbell Div, American Chain and Cable Co, Inc, Bridgeport 2, Conn*

MORE DATA? Circle 108, inside back cover

Unisorb Pads are the basic unit in a mounting specification used to install 107 machines, including heavy Gisholt Turret Lathes and small bench grinders.

Minneapolis-Honeywell reports...

# Unisorb Pads Saved Over $15.00 On Every Machine Installation!

The Minneapolis-Honeywell Regulator Co. Valve Division at Fort Washington, Pa., after careful pre-testing, found that Unisorb pads were both economical and efficient for mounting machines in their new plant. Here's why:

- Labor costs alone saved about $15.00 per machine (mounting time)
- There were savings on anchoring materials
- Reduces noise and vibration up to 85%
- Greatly reduced productive hours lost in moving
- Machines kept in alignment
- Provides ease of shop rearrangement
- Machines stay safely anchored in place

Company after company are discovering these same facts – that Unisorb Pads and Unisorb Level-Rite Mounts can save time and money, and cut noise and vibration, every time a machine is installed.

**TRY A SET IN YOUR PLANT! *UNISORB is available at leading Industrial Distributors, or write direct for the special Unisorb Money-Back Trial Offer.***

**UNISORB**
Division of The FELTERS Company

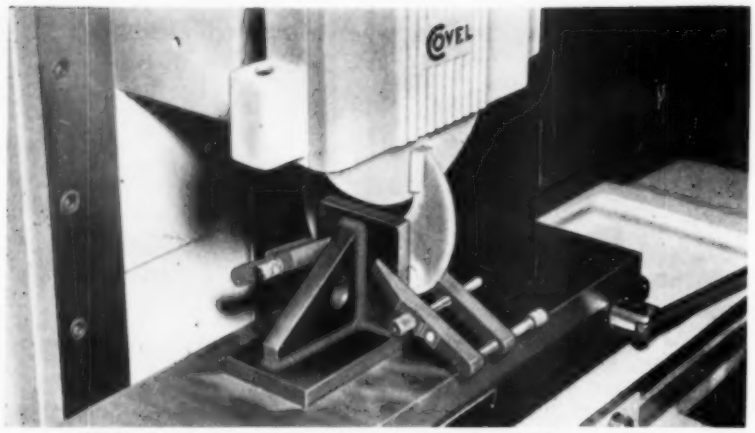
200 SOUTH STREET
BOSTON 11, MASS.

Want more information? Send for Unisorb Bulletin!

Please send me Unisorb Information Bulletin

Name .....
Position .....
Company .....
Address .....
City ..... Zone .... State .....

FEB-33

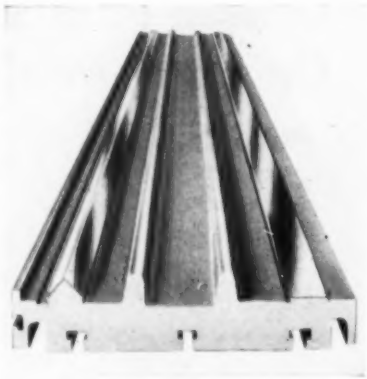



# This is not an ordinary surface grinder at work...

It's a Covel No. 10—built to do MICRO-PRECISION work on accurate snap gages like this. And it also does a top-notch grinding job on other tool room work such as form tools, jigs and dies—day after day and year after year to save you money. Covel pioneered with *hard chrome table ways* that keep this 6" x 18" machine in *top position* in the tool room grinder line-up far longer than grinders with ordinary ways. Covel-developed smooth *timing belt table drive*, hardened and ground lead screws and rigid vertical slide are among other outstanding features that add up to long-lived Covel MICRO-PRECISION performance.

## *First* with hard chrome table ways...

A special plating process developed by Covel applies a hard chrome surface to hand-scraped Vee and flat table ways—insuring long-lived accuracy. Many Covel chrome plated ways have been in service for ten years and more without noticeable wear and without a sign of flaking.



### *Ruggedly built... hand or power feed models available*

The No. 10, like all Covel Precision Grinders, depends on a heavy, well-ribbed and proportioned base and wheel head standard as a foundation for built-in MICRO-PRECISION. Both hand and power feed models have all hand wheels, including elevating hand wheel, conveniently located *below* table level.

**Micro-Precision a Covel Tradition-Since 1874**

Send today for your copy of "The Covel Precision Story" and complete data on the Covel Surface Grinder that meets your needs — seven sizes from 6" x 12" to 16" x 36". Ask for Bulletin AM-109

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN


## NEW SHOP EQUIPMENT

**High pressure regulator** of simplified construction delivers fast response and excellent stability under wide flow pressure fluctuations. The hand-loaded unit handles pressures up to 6000 psi, with set delivery pressures ranging from 1 to 5000 psi. A 50% change in inlet pressure causes less than ±2% variation in the set delivery pressure. Under less extreme variations, accuracy is held to ±1%.

*Hoke Inc, 199 Piermont Rd, Cresskill, NJ*

MORE DATA? Circle 109, inside back cover

**Deep groove radial bearings** for applications up to 900 F are available from stock in three R-series sizes: R-2, bore 0.1250 in., OD 0.3750 in.; R-3, bore 0.1875 in., OD 0.5000 in.; R-4, bore 0.2500 in., OD 0.6250 in.

*Industrial Tectonics, Inc, 3686 Jackson Rd, Ann Arbor, Mich*

MORE DATA? Circle 110, inside back cover

**Power drills** of the short length, heavy-duty variety are now available in a complete line of fractional, wire gage, and letter sizes. Factory pointed with 135° split points, the drills are the same length as sscrew machine drills, but have heavier web construction.

*Whitman and Barnes, Plymouth, Mich*

MORE DATA? Circle 111, inside back cover

**Subland drills** for drilling and chamfering prior to tapping are now available in all practical standard sizes. The drills come in tap sizes from 10-24 to ⅝-18 NC and NF, in three step lengths and three shank styles.

*Mohawk Tools, Inc, Montpelier, Ohio*

MORE DATA? Circle 112, inside back cover

**Brazing alloy,** named Phos-Sil-O, is a copper phosphorous alloy which does not require flux on copper to copper joints. It starts to melt at 1300 F and has a tensile strength of 90,000 psi.

*American Brazing Alloys Co, Box 11, Pelham, NY*

MORE DATA? Circle 113, inside back cover

**Spring tester** quickly and precisely tests small compression and extension springs. It will determine loads from 1/64 oz to 12½ lbs and indicate deflections in thousandths of an inch. It can handle springs up to 12 in. long with diameters up to 1¾ in.

*Carlson Co, 3457 Weidner Ave, Oceanside LI, NY*

MORE DATA? Circle 114, inside back cover

# is this the one best cutter for low cost MILLING?

We happen to know it is—on this specific job!

But frequently operators will rely on "pet cutters" for milling a variety of parts and materials. Result: Either higher costs or inferior finish . . . and usually both.

The problem has always been to match the cutter *exactly* to work and machine on every job.

Solutions to problems like these are our main product. And only after a penetrating study of machine, work, depth of cut, speed, feed rates and finish requirements do we recommend any cutter.

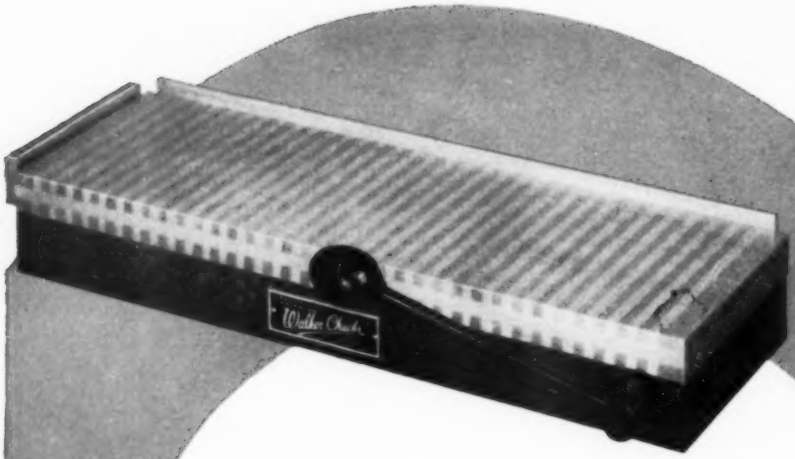
The inserted blade cutter pictured above is an example. On the work and the machine for which it was designed it is "the one *best* cutter for low cost milling."

We would welcome the opportunity to tell you more about this unique cutter selection service. Write:

*This helpful new booklet tells you how to reduce the cost of chips and improve your milling and boring performance. Ask for a free copy of booklet No. 68K.*

THE
**INGERSOLL**
MILLING MACHINE COMPANY
**CUTTER DIVISION**
505 FULTON AVENUE • ROCKFORD, ILLINOIS

CIRCLE 304 READER SERVICE CARD



## Finest, **Most Complete Line of Permanent Magnetic Chucks***

O. S. Walker offers the world's finest chucks – both rectangular and rotary – in a full range of sizes. Their magnets are the most permanent magnets ever produced! They're ceramic, with many times the coercive force of alloy magnets. The face of every chuck is *all steel* (no soft insulating material). Other important features: 50% less weight; low, low height; fine pole divisions for maximum holding power; easy "on-off" lever, with complete demagnetization in "off" position. Write for catalog.

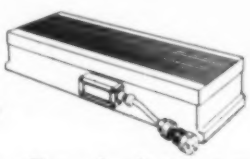
*Patents Pending

# O.S. Walker

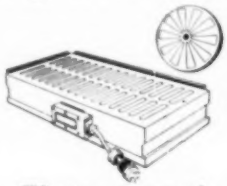
**O.S. WALKER COMPANY, INC.**
WORCESTER 6, MASS.

*O. S. Walker – The Original Designers and Builders of Magnetic Chucks!*

Special vacuum chucks for holding non-ferrous parts



Bar pole electro-magnetic chucks in 81 sizes



Electro-magnetic chucks in 172 sizes

Special electro and magnetic chucks and magnetic holding fixtures

Standard and special demagnetizers

## NEW SHOP EQUIPMENT

**Die forming alloy,** tradenamed Formaloy, is a high-strength zinc-base die metal alloy said to have properties surpassing those of ASTM Grade XXI alloys. The new alloy has impact strength about double that of slow-cooled conventional zinc-base alloys, higher tensile strength, smoother die surface, and uniformly fine, dense grain structure. Formaloy is readily workable and no special casting or machining techniques are required to fabricate the alloy.

*American Smelting and Refining Co, 120 Broadway, NY 5, NY*

MORE DATA? Circle 115, inside back cover

**Water-soluble cutting fluid,** called Fibrecool, is reported to make possible heavier cuts, higher speed machine operation, and longer tool life. It is transparent, quick emulsifying, and does not foam or become rancid.

*Fiske Brothers Refining Co, Newark, N J*

MORE DATA? Circle 116, inside back cover

**Hydrazine flux** leaves no rosin residue, is non-corrosive, non-hygroscopic, and permits prefluxing. It is designed for use in soldering elecrrical and electronic equipment.

*Fairmount Chemical Co, Newark, NJ*

MORE DATA? Circle 117, inside back cover

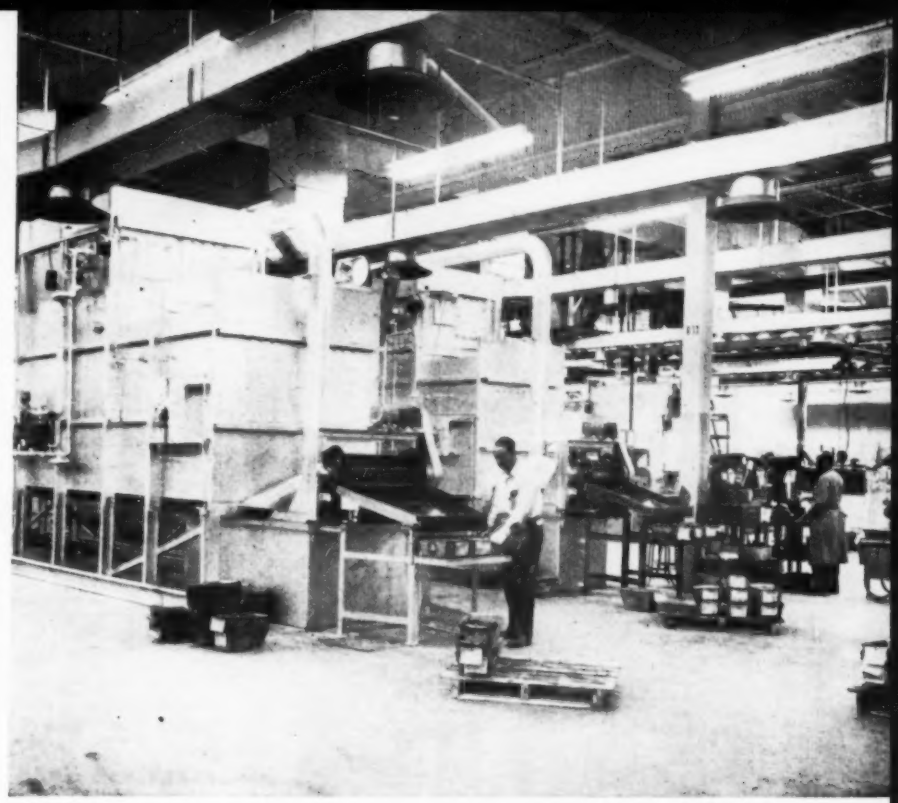
**Hydraulic motor gear reducer,** consisting of a gear type fluid motor mounted as part of a planetary gear reducer, is designed for use in driving such things as rotary fixtures, conveyors, and turrets. Measuring 8 by 8 in., it has a 4.6:1 reduction ration and provides 150 ft lbs of torque when used with a 1500 psi oil source.

*Webster Electric Co, Racine, Wis*

MORE DATA? Circle 118, inside back cover

*"Joe started at the bottom here and he's been losing ground ever since."*

CIRCLE 306 READER SERVICE CARD ►

# New heat treating equipment produces better fasteners at

# ALLEN

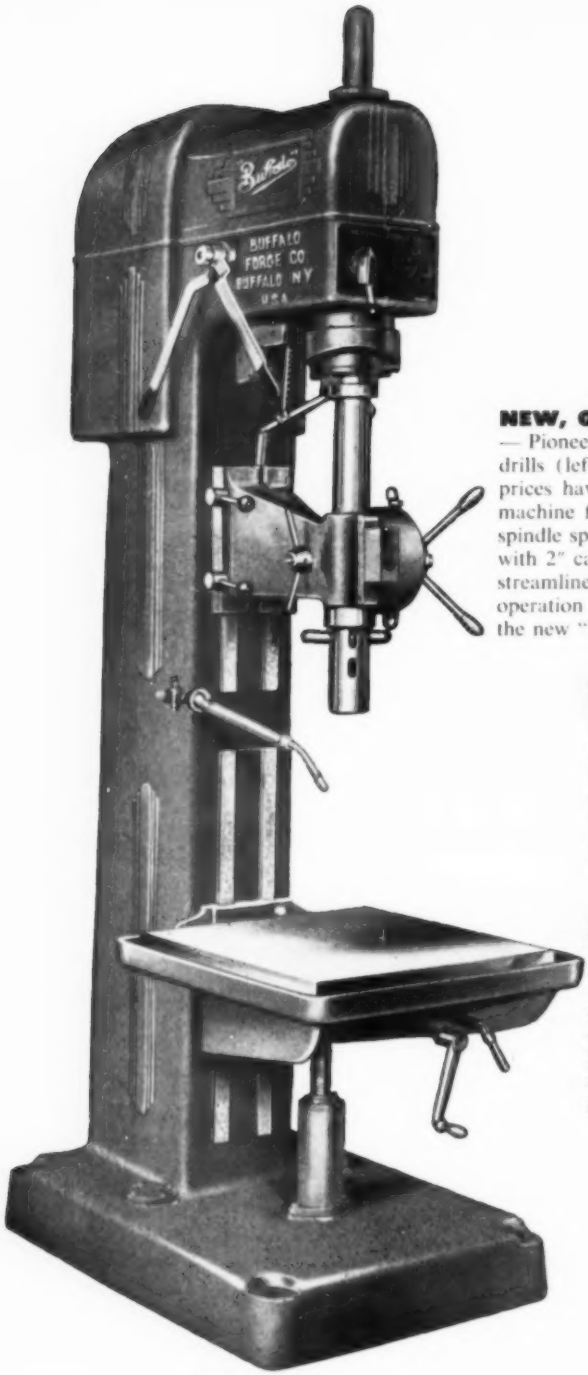
These new, specially designed Holcroft heat treating units harden, quench, wash, and temper in a continuous operation. Automatic devices regulate and record processing data for accurate, close control of this all-important manufacturing function.

Throughout Allen's great new plant, new facilities like these assure constantly higher quality in hex socket screws and related products. Today, more than ever, ALLEN is the "buy word" for socket screws, as well as keys, dowel pins, and pipe plugs.

Allen Flat Head Cap Screws, in countersunk tapped holes, give you absolutely flush surfaces. Where you can't countersink—fastening thin metal parts like covers, access panels, or guards, for example—Allen Button Head Cap Screws will give you the smooth, streamlined effect you want. Class 3A fit. Leader points, of course. Available from stock in all popular sizes. Ask your Industrial Distributor for samples and full information. Or write directly to The Allen Manufacturing Company, Hartford 1, Conn.

ALLEN HEAD
HEX-SOCKET SCREWS

# WHICH OF THESE
## BELONGS IN

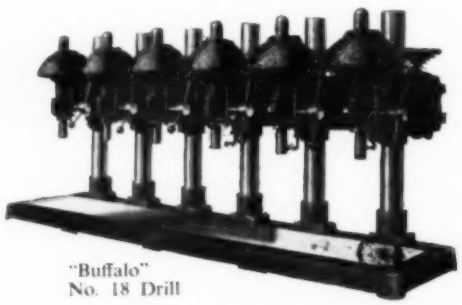



"Buffalo" R-P-Mster

**NEW, GREATER CAPACITIES IN THE LATEST** "R-P-Msters" — Pioneers in variable speed drilling machines, "Buffalo" "R-P-Mster" drills (left) are newly redesigned to bring you greater capacities. And, prices have been revised to bring you a pleasant surprise! This is the machine for high-speed, accurate production drilling, providing infinite spindle speed changes between 75 and 1300 RPM in the No. 3A Model with 2" capacity. The new, higher capacity "R-P-Msters" have the same streamlined design, rugged and massive construction and the smoothest operation ever built into a drilling machine. Get the complete facts on the new "Buffalo" "R-P-Mster" Drills. Use convenient coupon.

**MULTIPLE OPERATIONS SPEEDED BY HEAVY-DUTY DRILL.** Powerful and rigidly-built, the "Buffalo" No. 18 Drill is designed to help operators turn out better, faster work. Operation is simple; adjustments are easy. Choose from 19 models to suit your drilling needs exactly — single spindle bench or floor models and multiple units up to six spindles. Minimum deflection is the result of 6-spline alloy steel spindles which turn smoothly on precision ball bearings. Select the models best fitted to your needs — use handy coupon.

**A "STAND-OUT BUY" FOR GENERAL SHOP WORK.** The "Buffalo" No. 16 Drill offers you more quality features than any machine in its price range: 4 rates of power feed — 5-speed V-belt drive — hardened tool steel clutch members. These features are bound to lower your production costs — through faster and easier drilling, longest useful tool life and peak accuracy. Available in bench, floor or pedestal types, and in multiple units up to six spindles. For complete information on the "Buffalo" No. 16, mail coupon.



"Buffalo"
No. 18 Drill

ESTABLISHED 1877
"Buffalo"
MEMBER N.M.T.B.A.

**BUFFALO FORGE**
**509 Broadway**

Canadian Blower & Forge Co., Ltd.

**DRILLING PUNCHING**

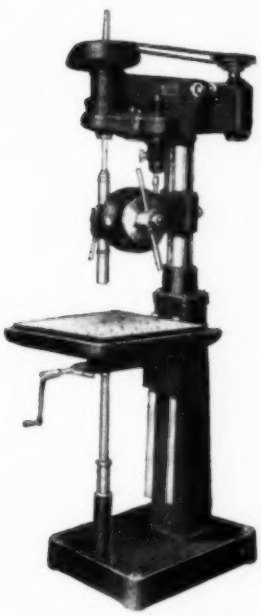
# "BUFFALO" DRILLS YOUR PLANT?

**NEW FEATURES MAKE A FINE DRILL BETTER.** Reports from users of the new "Buffalo" No. 15 Drill are beginning to come in to us. Owners, shop foremen, operators are all enthusiastic. They like the many design improvements which result in easier, faster operation, flexibility and a minimum of maintenance. Although unusually sensitive, the No. 15 is ruggedly built for full capacity operation without wear or strain. The new line includes bench, floor and pedestal models from 1 to 6 spindles. For complete data on the "Buffalo" No. 15 Drill, check and mail handy coupon.

"Buffalo" No. 22 Drill

**HIGH PRODUCTION, COMPLEX DRILLING OPERATIONS PERFORMED FASTER**—With batteries of multiple-spindle "Buffalo" No. 22 Drills (above). The operator of each bank can handle 2 to 4 setups with no stopping for adjustments. These husky, 96-inch high machines operate as easily as smaller sensitive drills, yet have a capacity up to 1¼" in mild steel. No wonder operators are enthusiastic — each spindle has both power and sensitive feed; all controls are within easy reach. "Buffalo" No. 22 Drilling Machines can add more profitability to *your* shop operations. Check and send coupon to find out *how!*

"Buffalo" No. 15 Drill



"Buffalo" No. 16 Drill

**COMPANY**
**Buffalo, N. Y.**

Kitchener, Ont.

**SHEARING BENDING**

**BUFFALO FORGE COMPANY**
**509 Broadway • Buffalo, N. Y.**

Please send me additional information on the following "Buffalo" Drilling Machines:

☐ **No. 22** ☐ **"R-P-Master"**
☐ **No. 18** ☐ **No. 16** ☐ **No. 15**

NAME ..... TITLE .....
FIRM .....
ADDRESS .....
CITY ..... STATE .....

**BUILD YOUR PRODUCTION ALONG THESE LINES**

**with BIJUR**

WITH Bijur Automatic Lubrication as an integral part of your machines, you benefit from continuous peak production. Plant after plant reports increased out-put and greatly reduced maintenance costs with Bijur-equipped machines. Costly downtime for lubricating by hand is eliminated. Every bearing is metered the proper quantity of oil at predetermined intervals. Work spoilage and bearing troubles caused by over-lubrication are avoided. Fire hazards are reduced. Personnel accidents are prevented.

More than a million Bijur-protected machines are currently in use. Hundreds of leading manufacturers standardize on Bijur as "built-in" components of their machines. Bijur emphasizes custom engineering, and will gladly cooperate with your machine builder in designing a lubricating system to meet the specific requirements of the machines you order.

Bijur designed into your machines now automatically assures satisfaction. It makes sense . . . and dollars, too! Why not write today for literature and engineering information?

**BIJUR AUTOMATIC LUBRICATORS—STANDARD EQUIPMENT IN MANY INDUSTRIES**
**Machine Tools • Business Machines • Printing Machinery • Textile Machinery • Food Product Machines • Bottling Machines • Packaging Machines • Sheet Metal Machines • Plastic Fabricating Machinery • Glass Products Machinery • Wood-Working Machinery • Industrial Sewing Machines • Special Process Equipment**

**BIJUR**
**LUBRICATING CORPORATION**
**Rochelle Park, New Jersey**
*Pioneers in Automatic Lubrication*

2370-B


## NEW SHOP EQUIPMENT

**Wheel dresser,** designed for use with standard gage blocks and sine table, dresses grinding wheel angles to within 0.0003 in. The diamond holder block has 2 in. travel; dresser can be adjusted beyond 45°, up or down. Cost is $195.

*Matco Div, Dept 10, Manting Tool and Die Corp, Morley, Mich*

MORE DATA? Circle 119, inside back cover

**Window units** for observing oil supply and operation of internal machine parts come in level, standard and open styles, in five sizes ranging from $\frac{5}{8}$ in. to $1\frac{3}{4}$ in. They are oil tight and can be flush mounted, requiring only a press fit into a reamed hole.

*Bijur Lubricating Corp, 151 W Passaic St, Rochelle Park, NJ*

MORE DATA? Circle 120, inside back cover

**Extruded columbium tubing** is now available commercially. It can be supplied in the following dimensions: rod, ¼ to 1 in. dia; tube, ½ to 1 in. OD, 0.085 to 0.020 in. wall thickness; both rod and tube in length up to 20 ft. Other sizes can be supplied on special order.

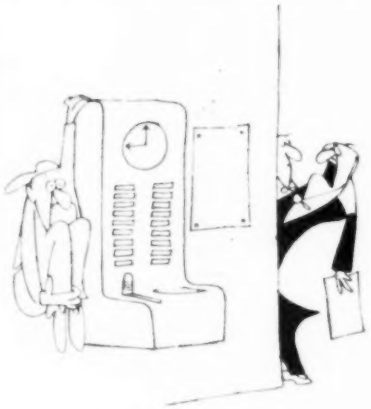
*Wolverine Tube, Div of Calumet and Helca, Inc, 17200 Southfield Rd, Allen Park, Mich*

MORE DATA? Circle 121, inside back cover

**Lateral ventilating hoods** made of Duracor plastic are claimed to offer substantial savings in initial cost and maintenance. Duracor is reinforced plastic that offers a combination of chemical, flame, and abrasion resistance. Tensile strength ranges from 11,000 to 15,000 psi; flexural strength from 20,000 to 30,000 psi.

*Ceilcote Co, 4881 Ridge Rd, Cleveland 9, Ohio*

MORE DATA? Circle 122, inside back cover



*". . . Who could that be punching in at 9 o'clock? . . ."*

# BATH *Tap'n Gage* TIMES

A series of technical discussions that will be helpful in getting better results from tapping and gaging operations

Vol. 1 No. 6


## Subject: Tapping the Difficult to Machine Materials:

The "missile age" has brought about the development of new materials designed to withstand the extreme stress, heat and strength problems inherent in jet engines, high speed aircraft, missiles and similar military hardware. These materials are classed as "difficult to machine" in comparison with the common types of steels, irons and light alloys.

### General Tapping Data

It is essential that all of the rules for good machining practice and tapping procedure be followed. Initial design specifications for threaded holes should favor the tap wherever possible. A copious supply of coolant must be provided and the coolant temperature should be maintained as low as possible. Tapping speeds should be reduced considerably in comparison with ordinary practice.

### Titanium and Titanium Alloys

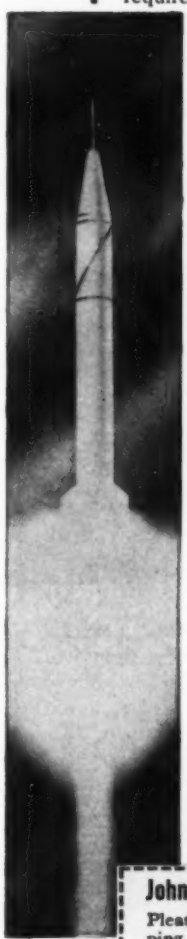
The basic characteristics of this material are low volume specific heat and low thermal conductivity. These thermal properties are best combatted by reducing the rate of heat generation. In tapping, heat generating friction is minimized by eccentric relief in the threads, additional chamfer relief, interrupted threads and increased back taper.

Hand taps with the standard number of flutes and chamfers of 4 to 8 threads have proved satisfactory. Bottoming holes may require series or sets of taps. Spiral pointed taps are satisfactory for through holes not exceeding 2 diameters.

Abrasive wear and galling can be reduced by case surface and oxide treatments. Tapping speeds vary from 40 SFM for the softer grades down to 10 SFM or less for the toughest grades. A maximum 65% of thread height is suggested and cutting fluid should be an activated sulpho-chlorinated oil. If standard taps are not satisfactory, Bath Type "R" or "RR" are recommended.

### High Tensile Steels (Super-Strength Steels)

The basic characteristic of these materials is the hardness after heat treating which ranges up to 58 Rockwell C. Tapping difficulties vary with the analyses even though Rockwell readings may be the same. Tap recommendations for these materials must include careful consideration of cut per tooth. Taps with four flutes and 6 to 8 threads chamfer have given best results. A cutting face angle which is approximately radial (0° rake) should be used. Tapping speeds should not exceed 10 SFM and cutting fluid should be activated sulpho-chlorinated oil, generously applied. If standard taps are not satisfactory, the use of special high Rockwell high speed steels such as Bath "N Steel", will be required.



### High Temperature Alloys (Superalloys)

The basic characteristic of these materials is their tendency to work harden. Hardness and resistance to cutting varies with each alloy group. Cutting speeds and tap design must be tailored to the particular alloy. A cutting face hook of from 0° to 10° should be used. The harder the material the lower the hook. Chamfers should be from 3 to 5 threads and thread relief should be used to reduce work hardening due to rubbing. Tapping speeds must be kept low and in extreme cases are in the 5 to 10 SFM range. Thread height should be kept as low as possible and activated sulpho-chlorinated cutting oil is recommended. If standard tap materials are not satisfactory, Bath "N Steel" will be required.

### Stainless Steel

Free machining grades are not much more difficult to tap than ordinary mild steels. The difficult grades require taps designed with free cutting characteristics. Thread relief, interrupted threads, hook angles of 8° to 12°, increased back taper and certain surface treatments help to reduce friction. Spiral pointed taps give good results where applicable. Tapping speeds are in the range 10 to 40 SFM and activated sulphorized and chlorinated oils are the most generally used coolant. If standard taps are not satisfactory Bath Type "R" should be specified.

*For further information on this subject, fill out and mail attached coupon with 25¢ for technical brochure "Milling, drilling and tapping the difficult to machine materials" — published by the Metal Cutting Tool Institute.*

Clip and mail coupon NOW!

**John Bath & Co., Inc.,** 22 Mann Street, Worcester, Mass.

Please send a copy of brochure "Milling, drilling and tapping the difficult to machine materials"—for which I enclose 25¢.

Name

Street

City or Town State


***Cylindrical and Thread Gages * Ground Thread Taps * Internal Micrometers** John BATH & Co., Inc.

22 Mann Street, Worcester, Mass.

Perfection Worm Gear Speed Reducers by American Stock Gear are available in 9 complete series with ratios ranging from 5 to 1 to 60 to 1 for input revolutions ranging from 300 per minute to 1800 per minute. Speed Reducers are furnished in horizontal right angle drive with worm in either top or bottom position and are also furnished in vertical right angle drive. Integral worm and shaft is made of selected quality, case hardened alloy steel. Threads are precision ground and accurately mated with worm gear. Shafts are mounted in Timken anti-friction roller bearings. Heavy rigid cast-iron housings . . . easily accessible oil filling level and drain plugs are provided for oil reservoir. Oil seals are of selected cirvis leather which assures maximum sealing effect. Available through your nearest American Stock Gear Distributor.

**Write for new 16 page catalog covering the complete PERFECTION Speed Reducer line.**

**AMERICAN STOCK GEAR DIVISION**
**PERFECTION GEAR COMPANY • HARVEY, ILLINOIS, U.S.A.**

## FIELD REPORT...

### Philco Gets $35 Million Orders

Company's Philadelphia plant has been awarded three contracts totalling $35.2 million. One is a $13.5 million Navy order for production of Sidewinder guided missiles; second is an $18.7 million AF contract for modernization of its world-wide communications system; third is a $3 million Signal Corps order for 700 radio receivers. The three production jobs will mean additional employment for hundreds at facility.

### Harvester to Discontinue Farm Implement Production

International Harvester Co will terminate production of farm implements at its McCormick Works in Chicago over the next three years. Manufacture of most of the items made at the plant will be transferred to other Harvester factories at Canton and East Moline, Ill, and Memphis, starting this summer. Production of malleable iron castings will be shifted to Waukesha, Wis. Under present plans, some foundry operations will continue after the implement work stops, and will require about 500 employees. Currently there are 3800 on the payroll. Changing nature of the farm implement business, plus the age and condition of the plant buildings are given as reasons for the move.

### Vermont Tap & Die Buys Pacific Tap of Burbank

Vermont, a subsidiary of American Saw & Tool Co, Louisville, Ky, has purchased Pacific Tap Co, Burbank, Calif, and will operate it as a division of the company which is located in Lyndonville, Vt. Principal products of the newly acquired Pacific Division are taps, dies, and associated tools used in aircraft manufacturing, metalworking, and the building trades.

### General Electric Sets Up Insulation Application Center

Center, designed to save manufacturers of electrical equipment up to a full year in evaluation of insulation materials and systems, has been opened by GE. Facilities at the Insulating Materials Dept, Schenectady, have been extended to include the testing of insulation systems under simulated operating conditions, making available new practical application measurements on physical strengths and capabilities of materials and systems. Work will

also include the development of less costly techniques for application of insulation to electrical apparatus. New equipment includes machines that enable engineers to deliver a 100,000-v shock to a motor, or to accurately measure weights as small as 1/1000 of a gram.

### Fisher Body Adds to Plant

General Motors is just about doubling the size of one of its two Fisher Body division plants at Grand Rapids. Addition to Plant No. 2 (auto trim fabrication) will be completed within a year. Present facility has 324,000 sq ft; expansion will add 200,000 sq ft, and will mean an increase in employment, but company won't estimate how many. Workforce is now about 1000.

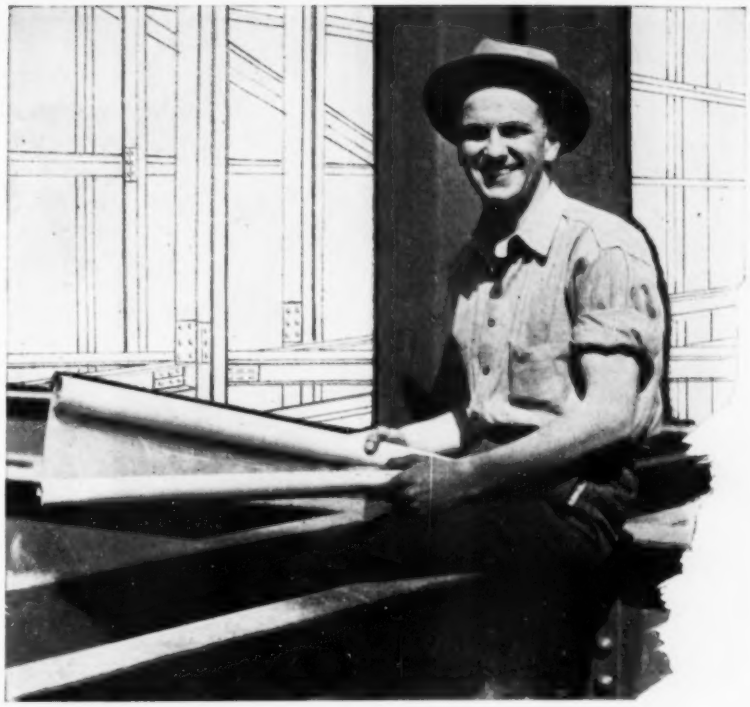
### Crucible in Canada

Crucible Steel Co of America is organizing a Canadian company to acquire the steel-making facilities of Sorel Industries, Ltd, located at Sorel, Quebec. The installation includes electric melting capacity of 35,000 tons annually, a 16-in. rolling mill, a 2000-ton press, and finishing equipment. New company will produce high speed, tool, stainless, and other alloy steel products for the Canadian market and for export.

### French Firm Licensed to Make Thompson-Ramo Computers

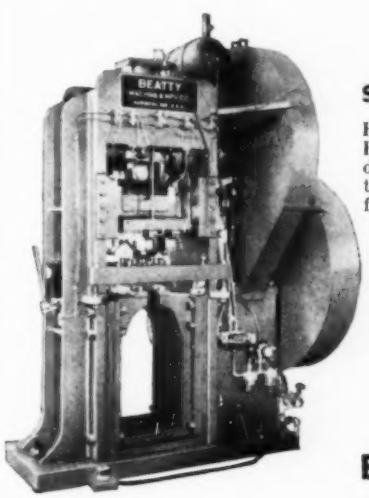
Licensing agreement has been signed by Thompson - Ramo - Wooldridge Products Co (division of Thompson Ramo Wooldridge Inc) and Intertechnique Co, located near Paris, for manufacture and sales of RW-300 computers in France. The French

*"I think it is simply terrible you heard an ugly rumor you were going to be fired. Believe me, I'm going to do everything I can to find out where the leak was."*

BEATTY EQUIPMENT IN YOUR SHOP MAKES HIS JOB EASIER, TOO!

On the job, erecting the structural steel which you fabricate, the precision, speed and accuracy of Beatty Machines pays off big for your customers, too! That's because Beatty equipment is engineered for maximum accuracy and speed in heavy metal-working — punching, slotting, bending, flanging, forming. Beatty machines help you deliver the goods on time, speed fabrication by reducing set-up time and material handling. The new Beatty No. 7 Detail Flange Punch, for example, flange-punches I-beams in only two passes where ordinary equipment requires four passes. Look to Beatty for heavy metal-working equipment — a complete line of punches, presses, shears, bulldozers.



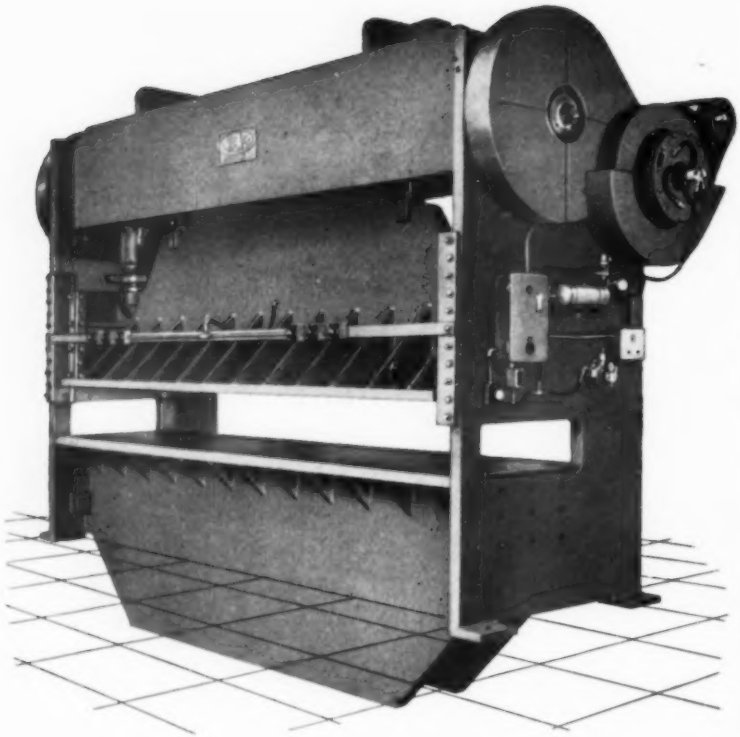

SPECIFICATIONS

BEATTY NO. 7 DETAIL FLANGE PUNCH — 100-ton cap., mechanically driven guillotine-type. Punches 1¼" hole through 1" mild steel and handles beams from 6" to 36".

*Write For Full Details*

BEATTY MACHINE & MFG. CO.
948 150th St., Hammond, Ind.

CIRCLE 312 READER SERVICE CARD



CHICAGO DREIS & KRUMP

# PRESSES
## STRAIGHT-SIDE TYPE

*large die area*
*capacities up to 400 tons*

This is a typical model of CHICAGO straight-side-type presses used for multiple punching, notching, and trimming operations. This press with a die area of 48 inches by 198 inches has a capacity of 200 tons.

*Complete recommendations for any job on request.*

6674

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies
Hand and Power Bending Brakes • Special Metal-Forming Machines

**DREIS & KRUMP MANUFACTURING CO.**
7434 South Loomis Boulevard, Chicago 36, Illinois


## Field Report . . .

company will start immediately to manufacture and market the digital control computers and all associated equipment in France and French possessions. TRWP has furnished the company with design, production, testing, and other information; Intertechnique engineers have been trained in the conduct of computer system application studies, and in the programming, theory of operation, and maintenance. French firm has received a contract from Electricite de France, electric power utility owned by the government, to furnish a computing data-logging system for the first commercial nuclear power plant in France.

### Elgin Payroll Up

Elgin National Watch Co has increased employment at its two plants in Elgin, Ill, by 30% since April of last year. Current workforce is 2204. All personnel who were laid off have been recalled. Short time schedules have been eliminated and most departments are working overtime. Company says that at least 200 more may be added to the payroll in July or August.

### Scovill Opens New Tube Mill

Scovill Manufacturing Co has opened a $10 million copper and brass tube mill in New Milford, Conn. Located on a 72-acre site, and occupying about 293,000 sq ft, the mills are producing copper tubes in straight lengths up to 200 ft and brass alloy tubes up to 100 ft.

*(continued on p214)*

*". . . and then I mentioned your point about my not making enough money to live on a scale in keeping with the importance of my position—so he gave me a less important position!"*

Unless you buy leaded steels directly from Inland's Indiana Harbor Works, chances are you've never seen this tag. But among Cold Drawers and Steel Warehouse men who process and sell leaded steels in a variety of forms to manufacturers, it is famous.

Every one of them recognize that behind this tag lies years of research, development and *unequaled experience.* Twenty years ago it marked the world's first commercial leaded steel. Today this tag represents the standard of performance by which all other free-machining steels are compared. It signifies LEDLOY* . . . the most machinable leaded steels obtainable.

**INLAND STEEL CO.,** 30 West Monroe Street, Chicago 3, Illinois.

*Get* Inland Ledloy *steels in cold drawn form, sometimes sold under different trade names, from leading cold drawers and Steel Service Centers from coast to coast.*

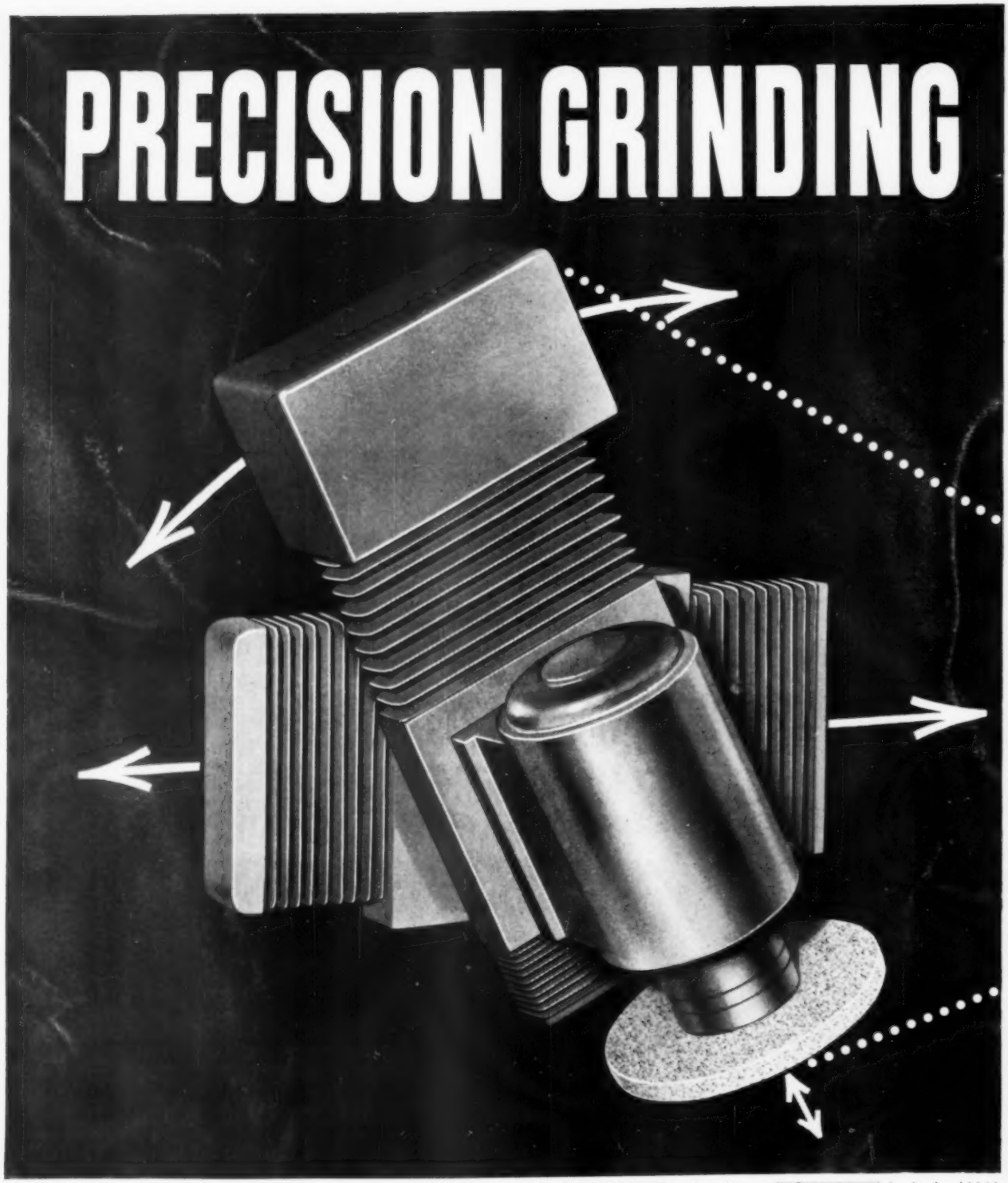
*Reg. Trade Mark

This is INLAND LEDLOY®

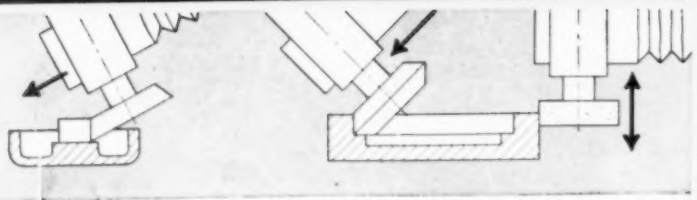
WORLD'S MOST MACHINABLE STEEL

INLAND STEEL COMPANY

# PRECISION GRINDING



Diagrams show typical applications of Frauenthal Standard Slide Units to a variety of grinding problems.



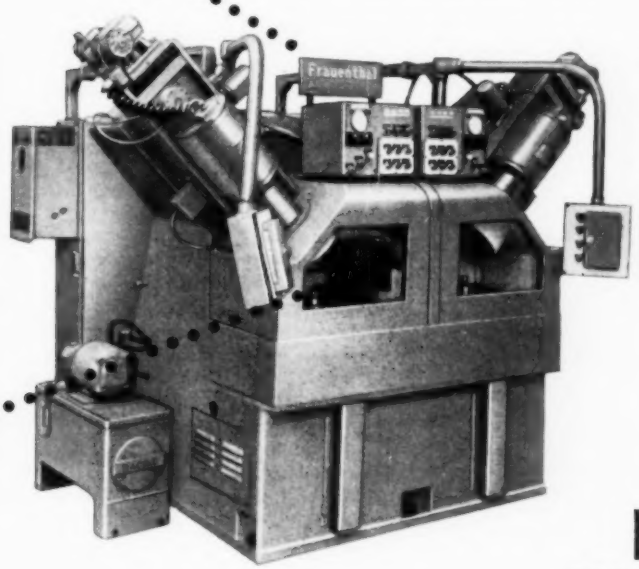
# at any angle!

## Frauenthal's creative engineering Now makes available Standard Slide Units in any number of combinations for production grinding applications . . .

IT IS NO LONGER NECESSARY to absorb special engineering and design costs when Frauenthal Standard Slide Units — plus a variety of grinding spindles — can be assembled to machine bases appropriate to a particular job. And these standard slides in single or multiple units can be arranged in an infinite number of spindle positions to accommodate an endless variety of simultaneous or sequenced, automatically controlled grinding operations.

What's more, you get all the advantages of Frauenthal's advanced engineering and design experience—proven on single and multiple-head grinders used on special production jobs. For example: parts for jet engines, diesel and automobile engines, tanks, gun mounts, radar units, large and small diameter precision bearings and machine tool components.

As illustrated here, this model of the versatile grinding compound shows how the Frauenthal Standard Slide Unit can be adapted to approach the work from any desired angle.




Here's a typical Frauenthal Double Head Vertical Spindle application utilizing two of the Frauenthal Standard Slide Units shown on the opposite page. Although applied to a particular grinding situation, these slide units retain versatility for angular positioning. Frequently, as indicated in panels 2 and 4 at the bottom of the page, diameters and adjacent surfaces are ground at one time with a single wheel dressed to the proper contour.

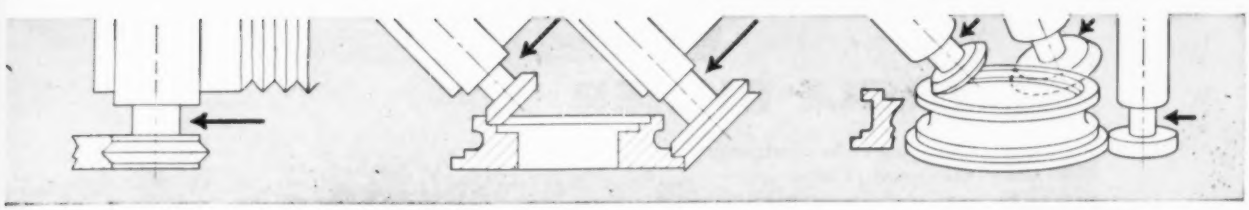
**Send a print of your "problem grinding part"** and our engineers will show you how to apply Frauenthal Standard Slide Units to solve the problem. Include in your letter pertinent production information — number of pieces, etc. Be sure to investigate the latest Frauenthal Vertical Grinders with Standard Slide Units. For complete details, contact Frauenthal of Muskegon.

**Frauenthal Division**

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN, U. S. A.

F-256 R



# Questions from the floor

*Are you getting most floor absorbent bulk (not weight!) for your money?*

*Does your floor absorbent become saturated before it does its job?*

*Does your floor absorbent create new hazards by absorbing light, thus reducing needed working light?*

*Does your floor absorbent "mud up" with oil and water?*

## THERE'S A TEST THAT ANSWERS ALL THESE QUESTIONS

In less than 15 minutes in your own office, you can get all the right answers scientifically. Our Eagle-Picher representative will bring a miniature laboratory right to your desk. Compare Eagle-Picher Floor-Dry with any other floor absorbent. See which wins out on overall economy and full-range safety. Eagle-Picher is eager to face comparative tests. Write today.

*Since 1843*

EAGLE PICHER

**EAGLE-PICHER**

The Eagle-Picher Company
Cincinnati 1, Ohio


## Field Report . . .

### Stokes Licenses French Firm To Build and Sell Furnaces

Under an agreement concluded between F J Stokes Corp, Philadelphia, and the French firm of Heurtey & Compagnie, Paris, one of the key companies in the Heurtey complex, Societe Generale d'Applications Electro-Thermiques (SGAET), in Boulogne-Billancourt, will be licensed to build and sell Stokes-designed vacuum melting and heat treating furnaces abroad. SGAET is the leading French manufacturer of atmospheric furnaces for melting, re-heating, and metallurgical processing of steel and other metals, and has already built a number of vacuum melting furnaces. This is the first foreign license ever granted by Stokes.

### Chicago Pneumatic Tool Acquires Drill Firm

Chicago Pneumatic has bought the assets of Reich Bros Manufacturing Co, Terre Haute producer of a line of truck and crawler-mounted hydraulic rotary blast hole drills and drilling rigs. Purchase also includes Reichdrill Manufacturing Co, Ltd, Glasgow, Scotland. Addition will be called the Reichdrill Division; engineering and production operations will remain in the Indiana plant.

### Scully-Jones Buys Setter Line

The Chicago company has purchased all tooling, drawings, and existing inventories for the self-opening stud setters formerly made by Jones & Lamson Machine Co, Springfield, Vt. S-J will manufacture the entire

*"You and your 'how's everything in your department, Fred'l"*

# HERE IS *QUALITY* AT A SENSIBLE PRICE

## *the NEW* CLEARING-HARRISON

11" MODEL JUST $1,950*

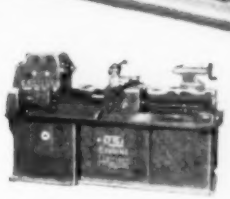
*Base Price F. O. B. Chicago Los Angeles and New York

Not only does the Clearing-Harrison look like a lathe that should cost 50% more than its list price, it performs that way. And it will continue to perform year after year as only a fine machine tool built to uncompromisingly high standards of precision can.

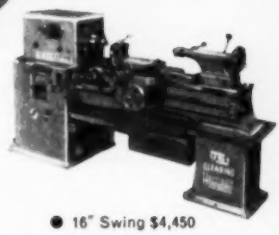
It has taper roller bearings in the spindle, hardened and ground ways, precision hobbed, heat treated nickel chrome gears. A removable section in the bed provides a gap giving a maximum swing of 18¾" on this 11" lathe. These and other fine features are found only in the Clearing-Harrison—sold and backed by Clearing division of U.S. Industries, Inc.

Delivery is immediate on this and on 13" and 16" lathes, too. Find out more about these and the many other benefits you get on the Clearing-Harrison. Write Clearing for details.

Clearing, division of U. S. Industries, Inc., also manufactures the Clearing-Axelson line of engine lathes, power presses of all types, dies and special tooling, and special equipment for the aircraft and missiles industry.



● 13" Swing $2,950



● 16" Swing $4,450

Also available with factory-built copying attachments.

## *Coast to Coast Service Facilities*

Clearing's nationwide facilities assure you of prompt service always. Replacement parts and accessories are stocked at Clearing and are available through all three plants, at all service centers and through all Clearing dealers.

**USI Clearing**

DIVISION OF U. S. INDUSTRIES, INC.

6499 W. 65th Street • Chicago 38, Illinois

Plants in: Chicago, Ill. • Hamilton, Ohio • Los Angeles, Calif.

CIRCLE 318 READER SERVICE CARD

W. C. "BILL" PINE, Hayes Chief Metallurgist, reports . . .

**BRAZING CALLS FOR KNOW-HOW PLUS SHOW-HOW**

Pioneer of controlled atmosphere heat treating, and developer of the *first* electric furnace for stainless steel brazing . . . Hayes today offers you one of the most extensive lines of furnaces and atmosphere generators for all types of metal bonding operations.

Hayes "KNOW-HOW" provides a customized brazing technique which takes into consideration every aspect of the job: Selection of alloys, placing and fixturing of work, choice of atmospheres, proper time-temperature cycles. Whatever the brazing application — from aluminum (900°F range) to platinum (3400°F range) — Hayes "SHOW-HOW" then proves the technique on full production-line equipment in our lab.

The Hayes answer to your brazing problem comes to you as a *complete package*. Our engineers provide free start-up service to duplicate laboratory results in your plant . . . fully instruct your staff to assure economical, maintenance-free brazing operations. The end product: a "Results Guaranteed" furnace-atmosphere combination that helps improve your product, increase production, and reduce costs. Write today for Bulletin 5711B describing typical conveyor-type brazing furnace.

**C. I. HAYES, INC.**

837 Wellington Avenue • Cranston 10, R. I.
Established 1905

ELECTRIC FURNACES

It pays to see Hayes for metallurgical guidance, lab facilities, furnaces, atmosphere generators, gas/fluid dryers.


## Field Report . . .

standard line and provide engineering facilities to take care of special customer design requirements. Addition of stud drivers augments firm's Safe-Torque line of clutches for precision nut running.

### $1 Million Worth of US Equipment Bought by West German Firm

Electric resistance weld pipe mill equipment, valued at more than $1 million, has been bought by Phoenix-Rheinrohr A G of Duesseldorf from the McKay Machine Co, Youngstown, Ohio, for Phoenix' new pipe mill at its Muelheim plant. Machinery will be used in the production of 6-⅝ to 16-½-in. OD API pipes. Delivery and instalment are scheduled for fall 1959. German company has an annual capacity of 2.6 million metric tons ingot steel, employs 28,000 workers.

### Kollsman Gets Add-On Order

Kollsman Instrument Corp, Elmhurst, NY, has an additional AF contract of $12 million for production of its automatic astro compass. Company currently is in production on orders for the compass totalling more than $50 million.

### Lukens Steel Completes $33 Million Expansion Program

The Coatesville, Penna, company has increased its steel-making capacity by 24% (to 930,000 ingot tons annually) and upped its plate-rolling facilities by some 40% to become the third largest producer of steel plate in the nation. New equipment includes a 140-in. plate slabbing

*"After studying this idea of yours, I'd be inclined to say that if another idea hits you, you should hit back."*


*Fast Delivery*

**Quality**

SIMONDS INDUSTRIAL CUT GEARS

★ **FINISHED GEARS**
★ **CUSTOM GEAR CUTTING**
★ **HEAT-TREATED, CASE OR FLAME-HARDENED**

You are sure of quality and prompt service when you place your industrial cut gear requirements with SIMONDS GEAR. We produce the full range of sizes in the types and materials you need from your blanks or ours. Let us quote on your next gear requirements.

* * *

*Stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.*

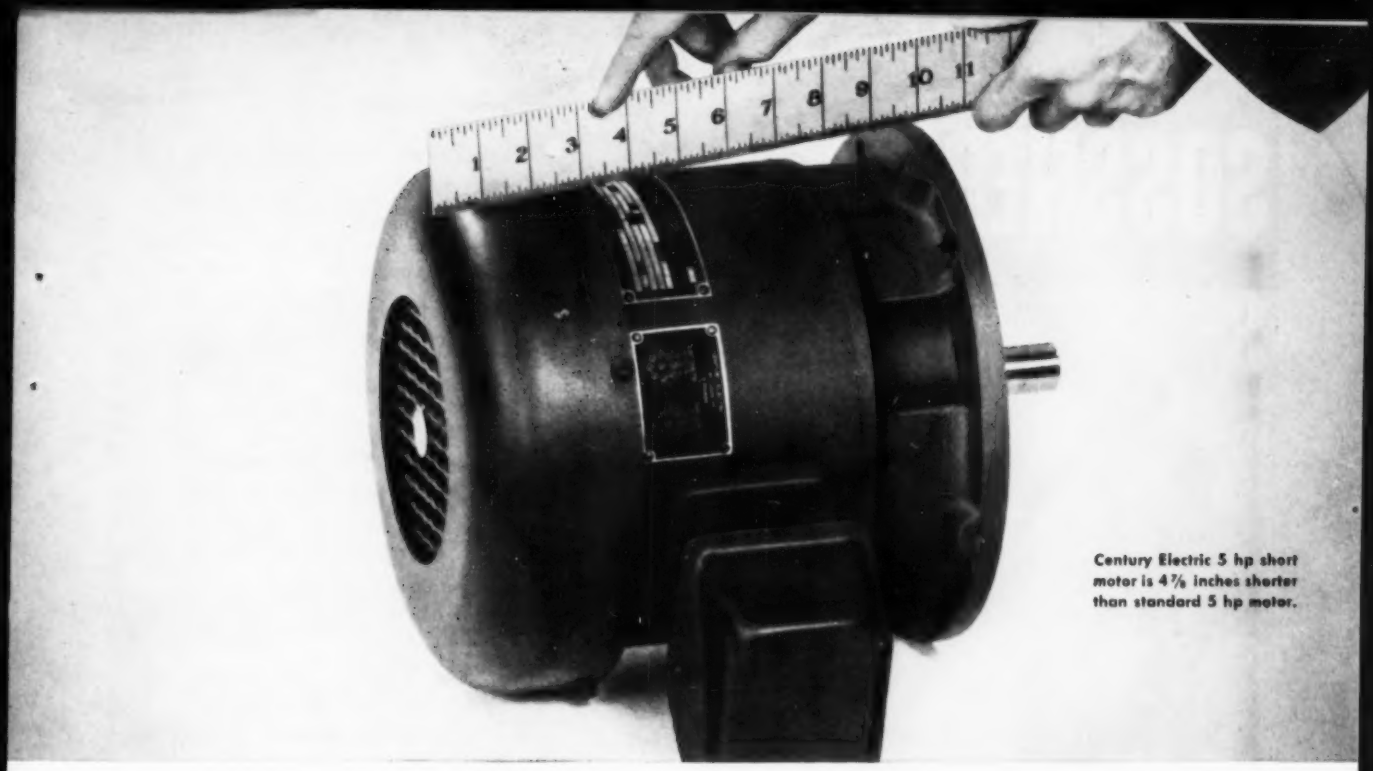
SPUR GEARS
BEVEL GEARS
MITRE GEARS
WORMS • WORM GEARS
RACKS • PINIONS

Cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite

SIMONDS GEARS

**THE SIMONDS GEAR & MFG. CO.**

LIBERTY at 25TH PITTSBURGH 22 PA.

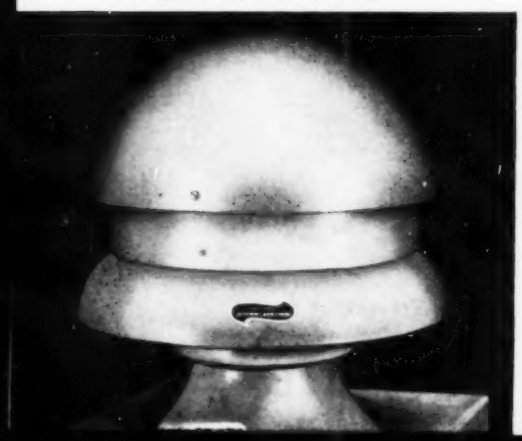


Century Electric 5 hp short motor is 4⅞ inches shorter than standard 5 hp motor.

# This new Century Electric motor is up to five inches shorter

(above) Standard flange gives flexibility in mounting. Motor can be installed horizontally or vertically.

(below) This compact power roof exhauster is typical of applications for short motors.



You have greater product design freedom with the new Century Electric short motor. It is two and a half to five inches shorter, but has all standard integral motor features. Here are the benefits:

**Save space and weight—** Your product can be smaller, lighter, a different shape . . . because the new motor is up to 35% shorter and has less bulk and overhang. Means you also reduce handling costs—both in receiving motors and shipping your product.

**Easy mounting—** You can use this motor in place of any standard end-mounted motor because it has a standard flange. It can also be mounted horizontally, vertically, or at any angle. Its small size makes it possible to mount the motor in a variety of places on equipment.

**Variety of applications—** You can get the new Century Electric short motor in totally enclosed or open frames and in ratings up to 15 hp. You can use it on many applications such as machine tools, roof ventilators, pumps and centrifuges. And it has the same quality features and high standards of all of Century Electric's complete line—up to 400 hp.

**More than a motor—** This motor is the result of a continuing search for ways to meet industry's needs. Another reason why you get more than a motor from Century Electric.

For more information, contact your nearest Century Eiectric Sales Office or Authorized Distributor.

**CENTURY ELECTRIC COMPANY**

**St. Louis 3, Missouri** *Offices and Stock Points in Principal Cities*

CIRCLE 321 READER SERVICE CARD

Century 59-3

# SOSSNER 3 exclusives

**1.** T S T **SOSSNER TRIPLE TEMPERED TAPS**

Only SOSSNER Taps are tempered THREE TIMES. This results in a tougher, more reliable, longer lasting tap.

**2. SOSSNER SPIRAL TAPS**

A choice of 3 standard designs for wider application.

Regular
Hook
Three Flute

**3. SOSSNER "elektraLUBE" SURFACE DEPOSIT**

"elektraLUBE" provides super lubrication at critical pressure points A & B where conventional lubricants stop functioning.

**Quality Controlled Since 1910**

Since its founding in 1910, SOSSNER has earned an industry-wide reputation for high performance and reliability of product through adherence to a strict Quality Control Program. As an example . . . all SOSSNER Taps are subjected to final inspection procedures of 100% on critical dimensions, and 200% on thread size. SOSSNER stocks a complete line of standard taps in all sizes and styles. Custom or Special tap orders receive prompt, knowledgeable handling by our tap specialists.

**SOSSNER TAP & TOOL CORPORATION**
**29 Broadway, Lynbrook, L. I., N. Y.**
*Inquiries from representatives and distributors are invited.*
Factory Warehouses In New York and Los Angeles
Dealer Stocks In Other Cities


## Field Report . . .

mill. The four-high reversing mill has max separating force of 12 million lbs, powerful enough to make a 4-in. reduction in the thickness of a heavy carbon steel ingot in a single pass through its 140-in.-wide rolls. New electric steel-making furnace produces up to 100 tons of quality carbon or alloy steel in a single heating cycle. Twelve soaking pits can each handle individual ingots weighing up to 60 tons apiece.

### Owatonna Tool Co Forms Precision Hydraulics Division

New division will concentrate on the hydraulics part of the regular OTC line of tools and hydraulic maintenance equipment. It'll also design and manufacture complete hydraulic pumping units for the OEM market.

### Diamond Drill Bits . . .

. . . will be marketed by Law Engineering Testing Co of Atlanta through its newly set up Letcor Sales Division. Law, basically a professional service organization, is headquartered in Atlanta, has eight branch offices. It was franchised last year by Hoffman Brothers of Punxsutawney, Penna, as distributor of oriented diamond bits and special sawblades in eight southeastern states.

### Honeywell Expands Computer Div

Minneapolis-Honeywell Regulator Co is establishing branch offices of its Datamatic Division in New York, Los Angeles, Boston, Chicago, and Washington to take care of accelerated sales and service of its electronic data-processing systems. Offices will be staffed by systems and

*(continued on p222)*

*"We need men with imagination . . . just imagine we're paying ya more!"*

## you can smile when its stainless

# UNILOY
## STAINLESS STEELS

No frowns . . . just smiles when protective trim is made from high strength stainless steel. Its solid quality . . . all the way through . . . and car life beauty will gleam through years of owner pride and satisfaction. Uniloy Stainless Steel provides these qualities—plus ease of fabrication, rolled to your exact specifications.

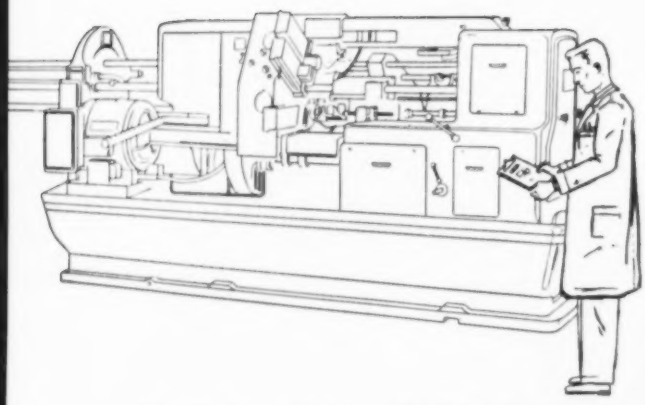
**UNIVERSAL CYCLOPS**
STEEL CORPORATION
BRIDGEVILLE, PA.

**STAINLESS STEELS • TOOL STEELS • HIGH TEMPERATURE METALS**

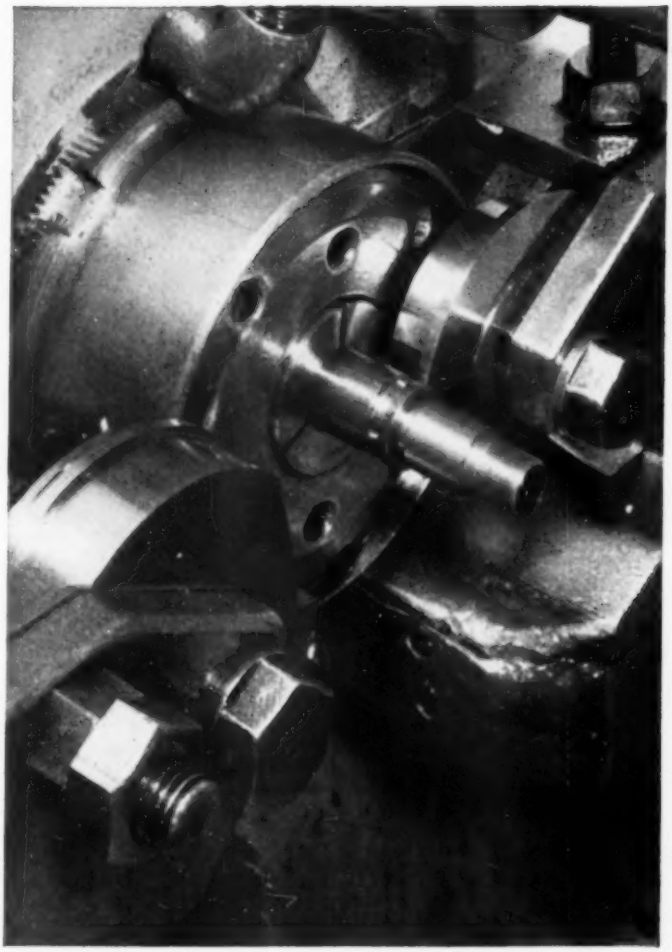


CIRCLE 323 READER SERVICE CARD

# Why Lusterized® Bars



## ...NO PROCESSING GRIT,



## Another Remarkable Benefit From Using Bliss and Laughlin's Patented LUSTERIZED® Finish Cold Drawn Steel Bars

The bright, clean finish of Bliss & Laughlin's Lusterized cold drawn carbon and alloy steel bars has more advantages than appearance alone.

One of the most enthusiastically mentioned is a very practical production advantage—the virtual elimination of the need to clean the chucking mechanisms of automatic bar machines between job set-ups.

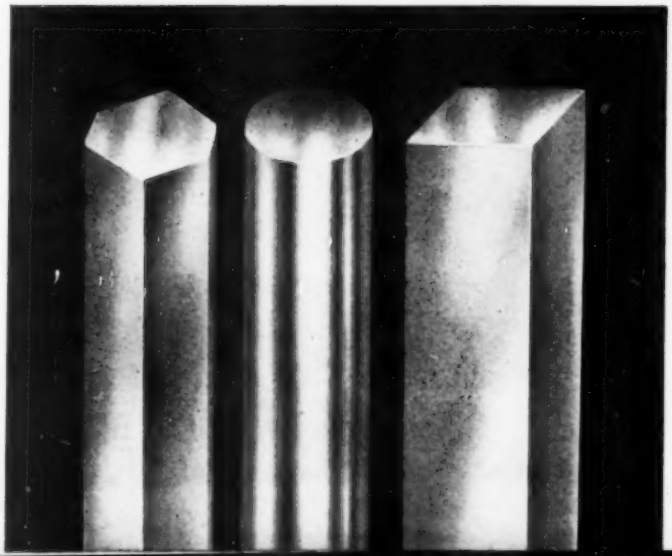
This saves time and money. Production schedules run faster and smoother. From beginning to end, Lusterized bars start cleaner, work cleaner, finish cleaner.

### EXCLUSIVE, PATENTED FINISHING PROCESS

The secret is Bliss & Laughlin's exclusive, patented Lusterizing process which removes the processing grit, oils and lime that clog the chucking mechanisms. Just how this is avoided is explained at the right.

Here again is another profit-wise reason why it's just good business to specify the big difference in cold drawn steel bars—the Bliss & Laughlin Lusterized difference. Especially satisfying is the knowledge that you pay only standard prices, and that Lusterized bars conform to the new closer tolerances recently announced by Bliss & Laughlin.

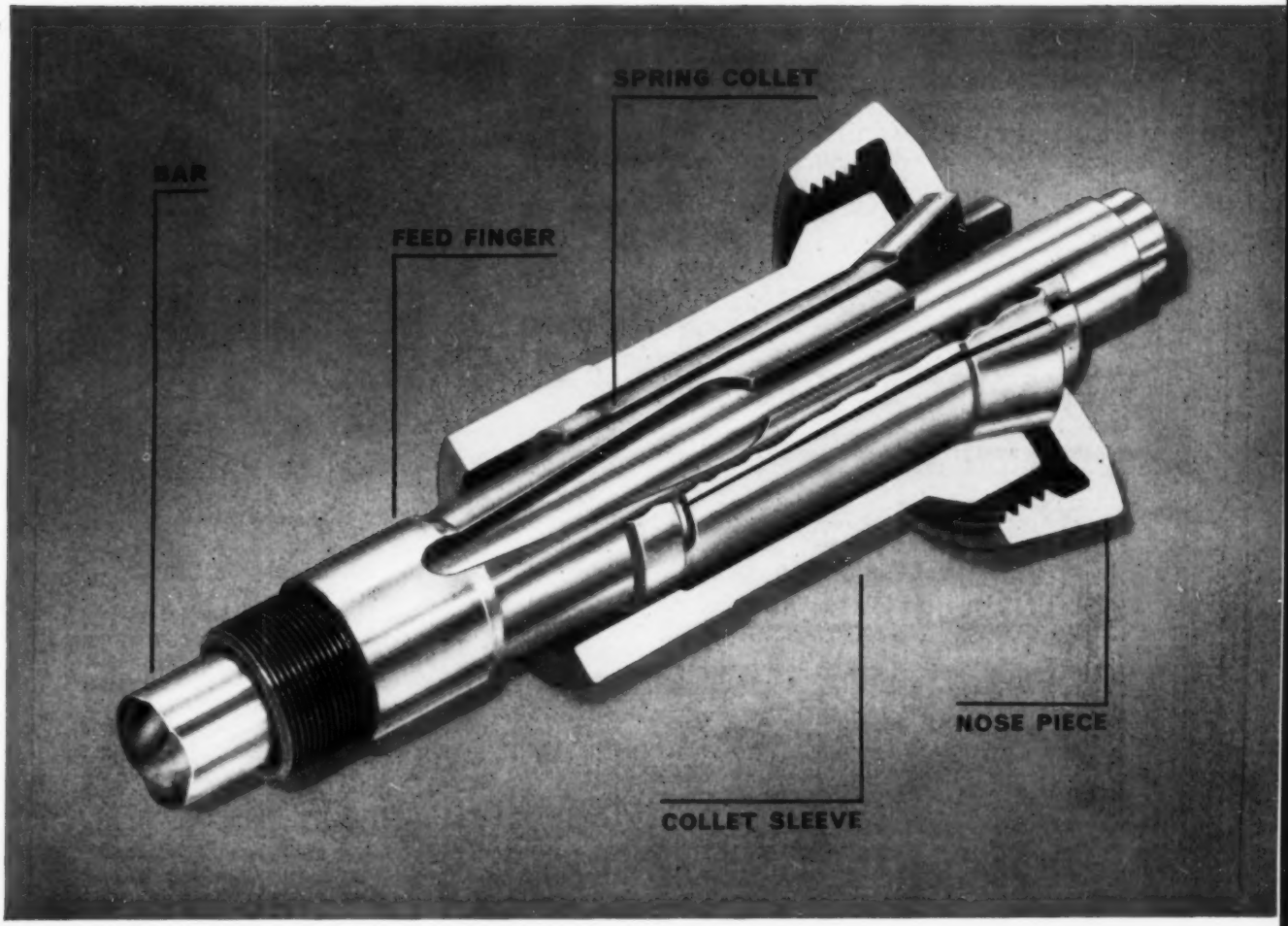
## The BIG DIFFERENCE In Cold Drawn Steel Bars Is The Bliss & Laughlin LUSTERIZED® Difference



CIRCLE 324 READER SERVICE CARD

# Don't Clog Automatics

## OIL OR LIME TO FOUL CHUCKING MECHANISMS




The photo at the left above shows the production station of a single-spindle automatic bar machine. Familiar to all is the substantial time consumed in cleaning dirt accumulations from the chucking mechanism, caused by the scraping action of the feed fingers on ordinary cold finished bars during feed outs. The front and back slides, the circular form tools and the tool holders must first be removed. The nose piece then must be removed and finally the chucking mechanism, which includes the collet sleeve and the collet. On a multiple-spindle automatic, several hours can be consumed in this cleaning operation.

The illustration above shows why foreign matter in the chucking mechanism causes sluggish operation, sticking of the collet sleeve and run outs. During the feed out operation, the processing grit, oil and lime on ordinary bars is scraped off when the feed finger returns to the operating position. This dirt works through the openings in the feed finger into the slits in the collet and on through to the collet sleeve. Wiping ordinary bars before machining does not effectively eliminate the processing grit, oil and lime which the Bliss & Laughlin Lusterized process removes at the mill.

*Originators of LUSTERIZED® Finish—The BIG DIFFERENCE in Cold Drawn Steel Bars*

**BLISS & LAUGHLIN**

GENERAL OFFICES: Harvey, Ill. • PLANTS: Harvey, Detroit, Buffalo, Mansfield, Mass.

*Specialists in Finish, Accuracy, Straightness, Strength and Machinability*

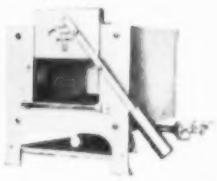
CIRCLE 325 READER SERVICE CARD

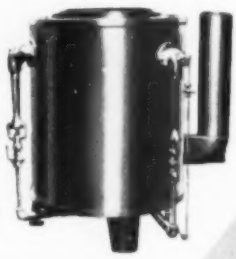
**NOTHING** heats like...
is more modern than... GAS
is more economical than...

NO BLOWER OR POWER NEEDED
**BUZZER**
REG. U.S. PAT. OFFICE
JUST CONNECT TO GAS SUPPLY

**INDUSTRIAL GAS BURNERS & FURNACES**
*Using Only Low Pressure Gas*
*for Clean, Fast, Quiet Heat-Up at Lowest Cost!*

**BENCH TYPE OVEN FURNACES**
For heat treating and pre-heating.
Temperatures to 2000° F.





**ATMOSPHERIC POT FURNACES**
For cyanide, salt bath and lead hardening. Temperatures to 1650° F.

*Write today for complete "BUZZER" CATALOG"*

Est. 1911
**CHARLES A. HONES, INC.**
121 So. Grand Avenue, Baldwin, L.I., New York • BAldwin 3-1110
"BUZZER" Burners & Furnaces for Heat Treating, Melting, Soldering

CIRCLE 326 READER SERVICE CARD

**Five Operations instead of one**

**with special KENCO ELECTRO-SAFE PUNCH PRESS**

Eighty inches long – extruded aluminum strips are punched, dimpled and both ends slotted at the rate of 350 per hour on a special KENCO, ELECTRO-SAFE PUNCH PRESS. Die changes permit six different parts to be handled on this machine, one of which is 16 feet long.

The Press engineered and built by KENCO utilizes three Standard KENCO 5 ton presses arranged with a double drive on the Center Press with heavy connecting shafts which evenly distribute the torque loading. The ELECTRO-SAFE SYSTEM prevents accidental tripping because the motor is always "dead" except during a stroke. A dial controls "Single Stroke," "Continuous Stroke," or "Inching" operation.

You too can reduce your punching costs. Check with KENCO for Suggestions – there's no obligation.

*Write for literature covering 2, 5, 8 and 15 ton Standard and Deep-Throated Models.*

**Job Facts:** Machine: Special Kenco Punch Press • Material: Aluminum – 80" long Extrusion • No. of Parts: 6 – one is 16 feet long • Operation: 5 – Punching, Dimpling, Slotting Ends • Production: 350 per hour.

2 Ton | 5 Ton | 8 Ton | 15 Ton | Deep Throat | Electro-Safe | Slow Speeds | Mark Series

also 18, 21 and 26 tons capacities

**KENCO MANUFACTURING CO**
5211 Telegraph Rd., Los Angeles 22, Calif.

THE MOST COMPLETE LINE OF SMALL PUNCH PRESSES IN THE WORLD


## Field Report . . .

methods analysts, customer training instructors, and sales personnel. Introduction of the Honeywell 800 electronic systems for processing business data and computing scientific problems caused sufficient response to convince the company that sales and service should be expanded and decentralized. The 800 is a moderately-priced system that incorporates the most advanced capabilities of the second generation of computers.'

### $2 Million Order to Ryan

Contract for additional AN/APN-97 helicopter hovering devices, plus spares, has been awarded the Electronics Division of Ryan Aeronautical by Sikorsky Aircraft. Ryan will produce some of these automatic navigation systems for use in Sikorsky helicopters assigned to the US armed forces, the remainder for English 'copters.

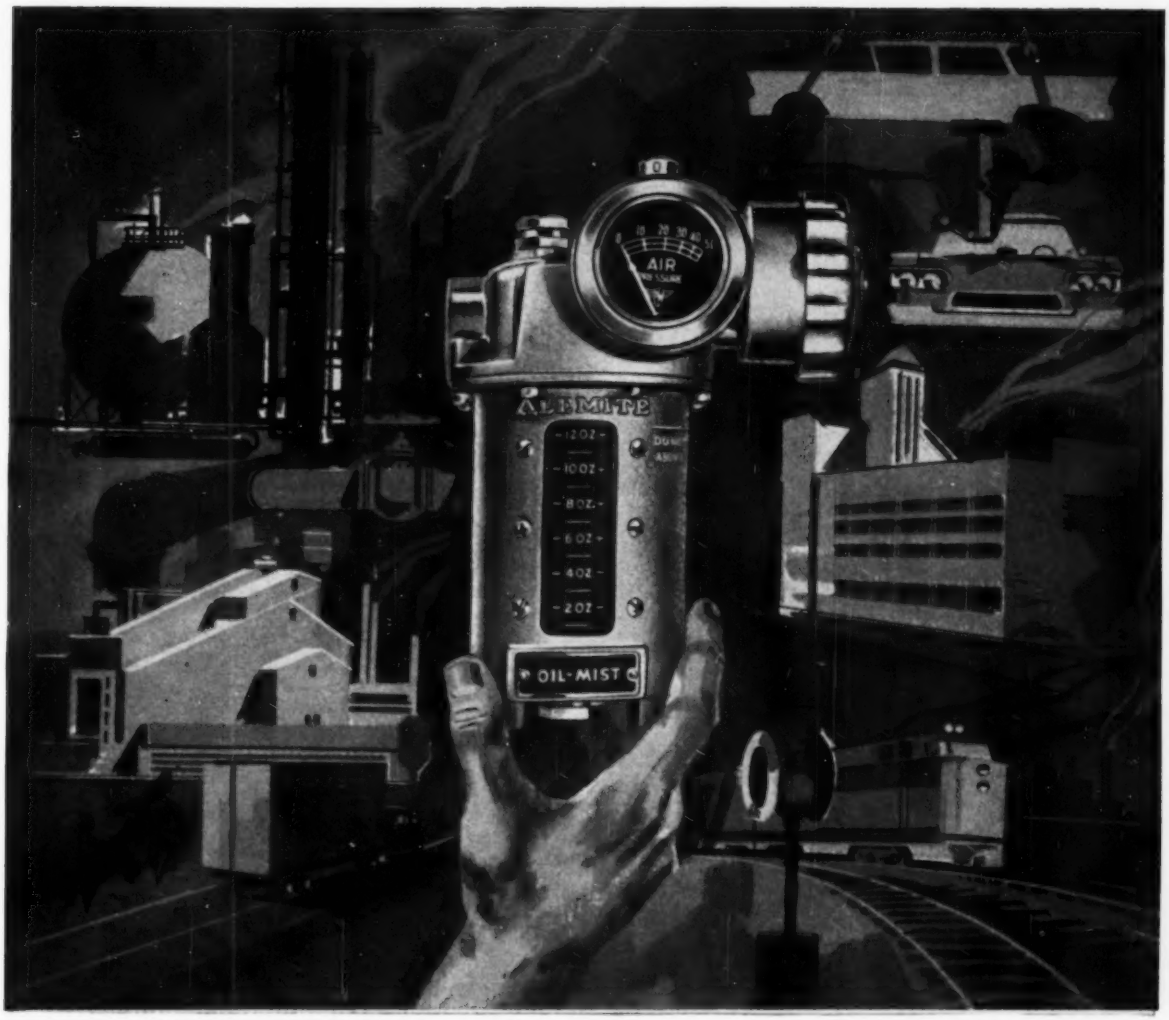
### Permanent Machine & Tool Co . . .

. . . an affiliate of Permanent Mold Die Co, Detroit, is opening a new plant in Florence, Ala, to make dies for the non-ferrous metals industry.

### US Steel Teaches on Wheels

Company is using a traveling classroom to instruct its employees in the proper maintenance of plant lubricating equipment. Mounted on a bus chassis so that it can be driven to any plant location, the 35-ft unit is equipped with all the components of a centralized lubricating system. The mobile classroom (seats 15) is fitted with every type of lubricat-

*"I didn't think you'd mind if I had shish-kabob for lunch, boss!"*




# WHY 500 BLUE CHIP COMPANIES LUBRICATE COSTLY MACHINERY WITH ALEMITE OIL-MIST SYSTEMS

An Alemite Oil-Mist Lubrication System provides safe, foolproof, automatic lubrication . . . increases machine output . . . reduces lubrication costs.

**Designed for a wide range of applications.** Oil-Mist provides constant, uniform lubrication of many sizes and types of bearings, from small sewing machine bearings to large steel mill back-up roll bearings or work roll bearings. Open type and enclosed gear trains and chain drives are lubricated by Oil-Mist when leakage problems exist. An Oil-Mist System is also ideal for lubricating slides, ways and cams, where a minimum of continuous lubrication is required.

**Used in both large and small plants.** Alemite Oil-Mist Systems are now operating in hundreds of plants . . . reducing operating temperatures and bearing wear . . . eliminating housekeeping problems and contamination due to over-lubrication . . . reducing man-hours and down-time. Check *your* plant. Perhaps you, too, can benefit from the many important advantages of a modern Oil-Mist System.

**Cut costs . . . reduce man-hours and machine down-time . . . extend bearing life . . . increase production . . . with a modern Alemite Oil-Mist Lubrication System**

***Write today for free Oil-Mist catalog!***
***Dept. F-59, 1850 Diversey Parkway, Chicago 14, Illinois***

Symbol of SW Excellence

**ALEMITE**
DIVISION
**STEWART-WARNER**
CORPORATION



CIRCLE 328 READER SERVICE CARD

with **LIPE**

**Automatic Machine Loading**

● You can meet and beat competition by getting peak production from every machine in your shop — new *and* old. Lipe Automatic Machine Loading delivers at least 90% of the gross geared capacity of any production machine, because stock is fed continuously. Your machines cut stock — not air!

● Lipe AML Bar Feeds automatically feed stock of practically every length, shape and material, in close-tolerance feedouts. Users report production increases of 40% . . . 90% . . . and even 200% per machine, plus labor benefits that are even more important. Workers are freed from back-breaking hand-loading of stock . . . concentrate on quality and machine set-ups. For a free estimate of what Lipe AML can do for your shop, send prints or samples of typical work. Write for full information.

*Stop Cutting Air and You Start Cutting Costs*

Lipe-ROLLWAY CORPORATION SYRACUSE, N. Y.

PIONEERS IN PNEUMATIC BAR-FEEDING

## Field Report . . .

ing equipment used in US Steel facilities. Employees at any plant can be given instruction on equipment identical to that in operation at their particular plant location. Demonstrators can convert from one type of equipment to another by simply placing different panels in the wall mounts.

### Lewyt Add-On Orders

Lewyt Manufacturing Corp, Long Island City, has an additional AF contract for production of Random Access Plan Position Indicators for use in the SAGE system. New order brings total of contracts received for SAGE equipment to $26.8 million.

### Production Die Casting Co . . .

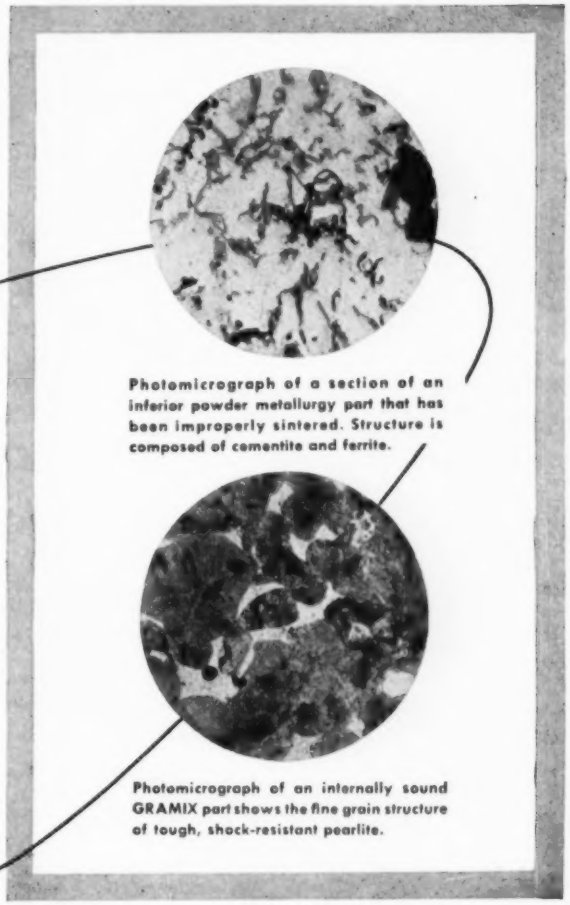
. . . Houston, has installed a 600-ton-pressure cold chamber aluminum die casting machine that triples the plant's production capacity. Said to be the only one of its type, size and production capability in Texas, it's one of the few in the Southwest capable of producing aluminum die castings weighing up to 16 lbs. With the new equipment the firm will be able to handle orders for heavy parts which previously had to be sent to Chicago or to the East or West Coast.

### AiResearch Manufacturing Co . . .

. . . has its first large production order from a European international airline for jet-airline ground support starting equipment. Order has been placed with the Los Angeles firm by KLM Royal Dutch Airlines. First two of 18 ground power units, together with installation kits, will

*"Thanks Joe! I never could make a nice, round 'O'!"*

# Quality of GRAMIX® precision parts insured by metallurgical control in the laboratory *proven by performance on the job!*



Photomicrograph of a section of an inferior powder metallurgy part that has been improperly sintered. Structure is composed of cementite and ferrite.

Photomicrograph of an internally sound GRAMIX part shows the fine grain structure of tough, shock-resistant pearlite.

To assure the dependable performance of GRAMIX powder metallurgy parts in actual operation, the United States Graphite Company combines exacting laboratory tests and rigid production controls to insure the quality of every GRAMIX part. Through the use of the metallograph, for example, GRAMIX engineers can check the internal structure of a part. A comparison of the photomicrographs shown above readily shows the sound under-the-surface quality of a GRAMIX part as opposed to the poor internal composition of an improperly sintered part. In the photomicrograph at the top, notice the cementite between the ferrite grain boundaries. This cementite will tend to break up and rupture under shock. The surface of the material is decarburized and only remnants of pearlite remain. *This condition is due entirely to the lack of adequate sintering control!*

The photomicrograph of the GRAMIX part at the bottom shows a fine grain pearlite structure that's tough, strong and wear resisting. Absolute sintering control along with precise metallurgical control in the laboratory is utilized by The United States Graphite Company to positively assure quality GRAMIX parts.

Write today for these helpful engineering manuals. Engineering Bulletin No. 18 covers design and metallurgical requirements and alloy selection of GRAMIX bearings. No. 19 contains facts about GRAMIX Machine Parts and No. 21 contains general information on GRAMIX products from Powder Metallurgy. Get your copies now.

X-264-1R

## THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 23, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDER METALLURGY • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

*RAY RIVERS, 33 years of service, LENOX chief test man*

# LENOX *HIGH SPEED STEEL*

## band saw blades

Cut faster . . . take greater feeds . . . last longer than conventional sawing methods, the new *LENOX High Speed Steel* Band Saw Blades assure greater production rates. Recommended specifically for special high speed steel band saw machines, these new Lenox blades have performed successfully on some regular band saw machines. Available in standard and hook tooth design.

***FREE! NEW HELPFUL HINTS ON HIGH SPEED STEEL BAND CUTTING***

New and informative product data sheet offers the complete story of Lenox High Speed Steel Band Saw Blades with helpful suggestions on cutting. Write today for Data Sheet No. 1202.
For help with your specific cutting requirements, a high speed steel band saw specialist direct from factory is ready to serve you. Please write or call for immediate attention.

**LENOX**
THE TOOLS OF THE BLUE BOX

**AMERICAN SAW & MFG. COMPANY**
SPRINGFIELD, MASSACHUSETTS • U.S.A.


## Field Report . . .

be delivered by June 1, the remainder by Sept 1. AiResearch will ship its small gas turbine engine (GTC 85-90) to Schiphol, Amsterdam, where KLM technicians will install the units in Volkswagen panel trucks.

### NRC Equipment Corp . . .

. . . Newton, Mass, subsidiary of National Research Corp, and a leading producer of high vacuum equipment, has opened a West Coast engineering office in Palo Alto, Calif. Growing use in the West, particularly by firms in the San Diego-Los Angeles-San Francisco areas, of exotic and refractory metals, vacuum metallizing equipment, and other high vacuum products used for research and production, made the move logical.

### Ryerson Adds Aluminum in LA

Joseph T Ryerson & Son has added Reynolds aluminum to its stocks at the Los Angeles facility. Complete service on aluminum, in addition to service on steel, will be available to metal consumers in the Southern California area. New stocks include rod, bar, sheet, plate, structural, pipe, and other shapes.

### IBM Sets Up Division For Advanced Systems Development

New division has been established to increase further the development of wholly new systems in the general field of information processing. Designed to "explore new applications made possible by the most advanced technologies," goal will be to design and engineer commercial machine systems to mechanize "hitherto undeveloped information handling areas."

*"Matter of fact, Buster, I have my resignation right here with me!"*

A-B QUALITY

## ALLEN-BRADLEY
## Solenoid Starters give

# *MORE MILLIONS OF TROUBLE FREE OPERATIONS*

***. . . and for good reasons***

**• ONE MOVING PART**
With this simple solenoid design, there's virtually nothing to go wrong—all trouble-causing bearings, pivots, and flexible jumpers have been eliminated.

**• DOUBLE BREAK, SILVER ALLOY CONTACTS**
Allen-Bradley silver alloy contacts never require maintenance. They are always in perfect operating condition . . . and remain so until completely worn away.

**• SIMPLE UP-AND-DOWN MOTION**
The virtually frictionless, straight line vertical motion provides uniform contact pressure at all times—and assures consistent, rapid operation of the contactor.

**• RELIABLE OVERLOAD PROTECTION**
All A-B starters are equipped with two permanently accurate and reliable overload relays that protect motors against "burnouts." Three overload relays can be furnished.

**BULLETIN 709 STARTERS** are made in 9 sizes from Size 0 (at left) up to Size 8.

**BULLETIN 709 SIZE 7** with maximum ratings of 300 hp, 220 v; 600 hp, 440-550 v.

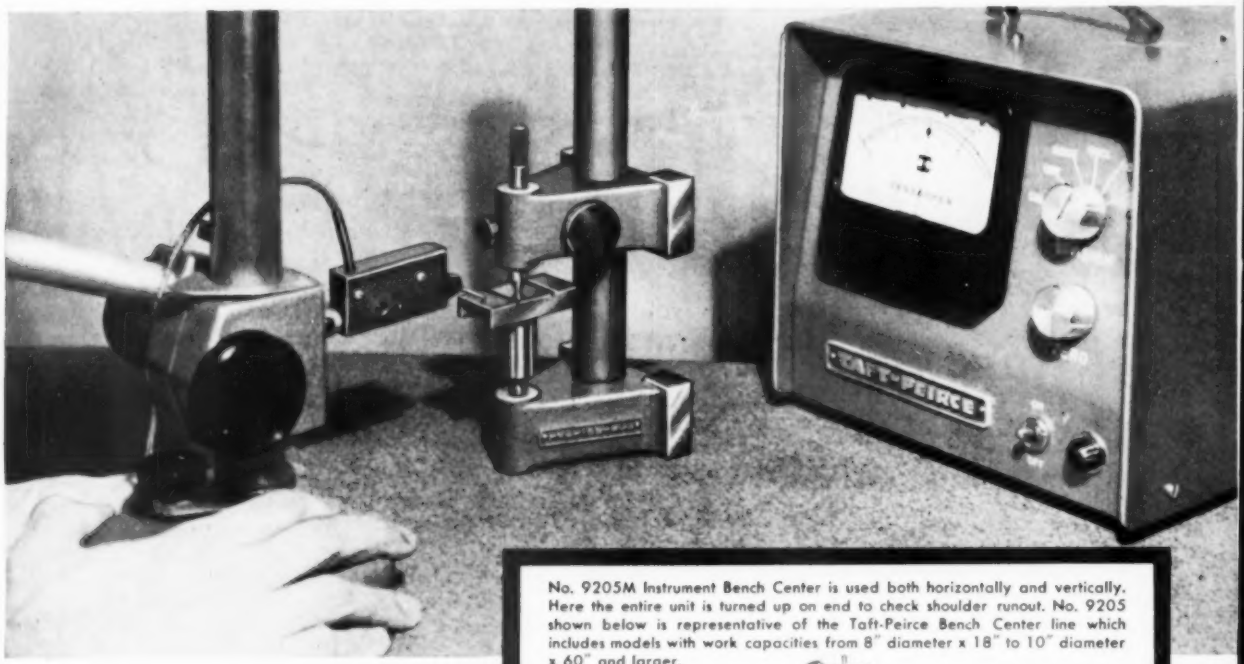
# ALLEN-BRADLEY

Allen-Bradley Co., 1320 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

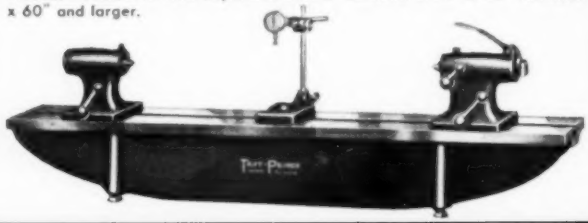
***QUALITY MOTOR CONTROL***

FROM THE TAFT-PEIRCE METALWORKING FAMILY . . .

# Precision Tools that make it easier



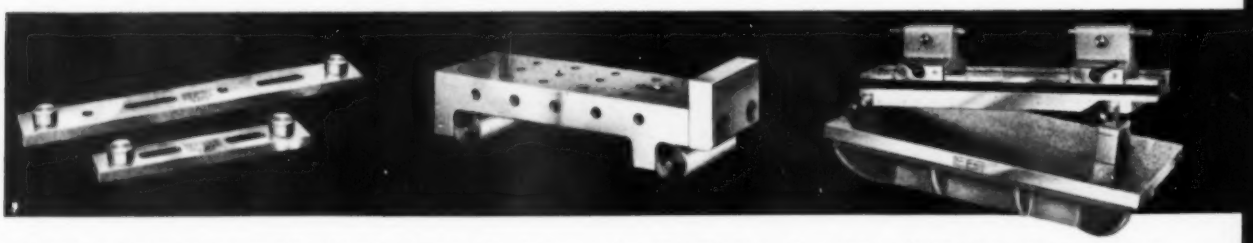

No. 9205M Instrument Bench Center is used both horizontally and vertically. Here the entire unit is turned up on end to check shoulder runout. No. 9205 shown below is representative of the Taft-Peirce Bench Center line which includes models with work capacities from 8" diameter x 18" to 10" diameter x 60" and larger.



## *Bench Centers allow fast, accurate inspection of parts and components*

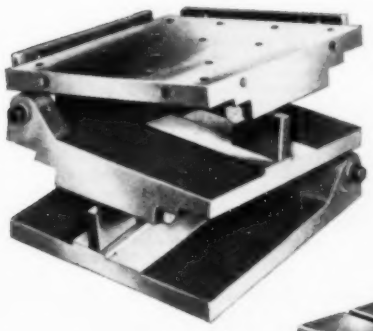
Taft-Peirce Bench Centers give you a fast and accurate method of inspecting work on arbors, mandrels or directly on centers.

Instrument Bench Centers are specifically designed for speed, accuracy, and versatility in checking miniature and sub-miniature parts. The Standard Bench Center Line offers a large number of headstock, tailstock, and bed combinations for handling work of practically any length and diameter; and special purpose attachments can be designed and manufactured. Bench Center beds are also available separately, for mounting shop dividing heads and similar inspection equipment.

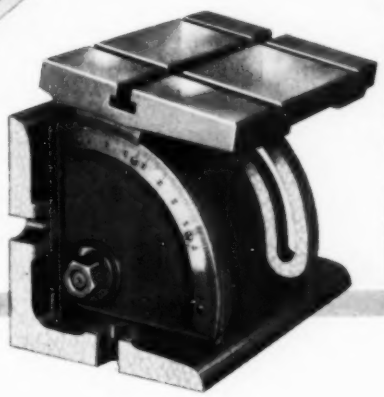


**Taft-Peirce Angle Setting and Checking Equipment.** Sine Bars, Sine Blocks, and Taper Testing Fixtures are made with the precision needed to speed and simplify extremely accurate setting of angles . . . for layout, light machining, or inspection. **Sine Bars** provide maximum angle setting accuracy because of their close tolerances for bar flatness, squareness and parallelism, and button location. They are available in 5", 10" and 20" sizes. **Sine Blocks** are heavy duty workholding fixtures for angular work. Each block is equipped with a precision ground end plate and tapped holes on top and sides for convenient work mounting. In 5", 10" and 20" sizes. **Taper Testing Fixtures** are a real help for precise inspection of tapers machined on centers. They combine a special 10" or 20" Sine Block with movable head and tailstock. They also double as highly precise Bench Centers.

# to produce Quality Products



Sine Angle Plates



Toolmaker's Adjustable Knee

**Sine Angle Plates** speed and simplify setting of a wide variety of angular work for machining and inspection. Top plates have end stops for positioning work and tapped holes for clamping. A precision ground .100" step in the base allows setting of small angles down to zero with standard gage blocks. Available for both simple and compound angle work.

**Toolmaker's Adjustable Knee** is valuable for fast setup of work for angular layout, machining, and inspection. The tilting work table swings to any angle and clamps firmly. Has graduated quadrant and vernier scale, and sine buttons for extremely fine settings.

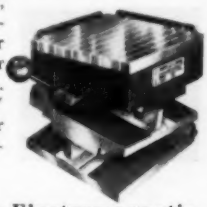
SEND FOR NEW CATALOG ON PRODUCTION AND INSPECTION EQUIPMENT... 34 pages of information on the complete Taft-Peirce line is included in Catalog No. 511, just released. Send for your copy, today.

## A Complete Line of MAGNETIC CHUCKS

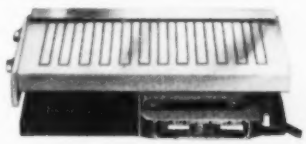
Taft-Peirce Superpower Magnetic Chucks provide many opportunities to lower production costs on an ever-increasing range of work. These are just some of the many types available in the Taft-Peirce line.

**Rotary Electromagnetic Chucks** pack maximum holding power in a small space to provide low-cost setups for flat rotary grinding. Ten standard sizes from 5⅛" to 30½" diameter. Magnetic Work Drivers are also available for centerless grinding setups.

**Sine Angle Magnetic Chucks** provide direct, positive work-holding, for compound or simple angles. Comes in 6" x 6" permanent or electromagnetic models.



**Superpower Electromagnetic and Permanent Magnet Chucks** provide heavy magnetic flux concentration, permitting a greater variety of simplified setups for grinding, milling and light planing. Superior holding power assures safe and accurate machining.



**Magnetic Chuck Bulletin No. 412** gives complete data and workholding ideas. Send for your copy.

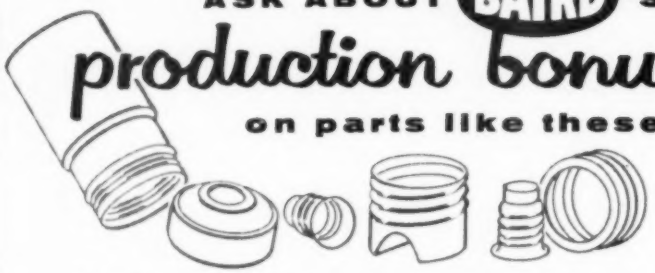
**TAKE IT TO TAFT-PEIRCE**

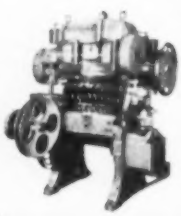
13 MECHANIC AVENUE • WOONSOCKET, R.I.

ASK ABOUT BAIRD'S

# production bonus

on parts like these





The Baird "PRODUCTION BONUS" is the worthwhile sum of TIME, TOOLING and MATERIAL cost-savings effected by BAIRD MULTIPLE TRANSFER PRESS features NOT found in other machines or methods producing 150 pieces per minute.

## for example

BLANKING and CUPPING for this electric lamp screw base are done at the blanking station on the same press that completes the part.

NO SECONDARY OPERATIONS required for side-piercing (back and front).

THREAD-ROLLING—again on the same press—completes this part. Thread-rolling attachment is cycled to the press speed.

From strip to finished screw base on ONE machine with ONE basic tooling, at a production rate of 150 pieces per minute!

Ask Baird about this unique high-production method . . . adaptable to a wide range of bases, ferrules, and other small drawn parts requiring multiple operations. Write Dept. AM.

**THE BAIRD MACHINE COMPANY**

STRATFORD • CONNECTICUT

BAIRD

Six and Eight Spindle Chuckers • Automatic Multiple Transfer Presses • Automatic 12 Station Rotary Forming Machines • Vertical Continuous Lathes • Automatic Four Slide Machines • Pneumatic Ribbon Metal Forming Machines • Thread Rolling Machines • Machinery for Chain and Roller Chain Production, Ring Compact Heads and Disk Production • Thin Section Bearings

BBA59


## Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

### MACHINES AND ATTACHMENTS

**1** ABRASIVE SURFACE GRINDERS—*Landis Tool Co, Waynesboro, Penna.* 8-page catalog CGS-59 presents illustrated description of full line. Specifications and extra equipment included.

**2** AUTOMATIC CONTOURING CONTROL SYSTEM—*Electronic Control Systems, Division of Stromberg-Carlson, 1400 N Goodman Ave, Rochester 3, NY.* 12-page booklet gives details on Digimatic Model 191 available as original equipment on leading makes of machine tools, or easily installed on existing units. Describes high performance closed-loop control system for medium duty machines with feed rates up to 25 ipm and four auxiliary command on-off functions; excellent for both short and long runs of small parts; cuts true circles, curves, and straight lines. Operational details and specifications included.

**3** DOUBLE CRANK PRESSES—*Federal Machine & Welder Co, Warren, Ohio.* Illustrated bulletin covers Warco line of straight side units in capacities from 60 to 400 tons.

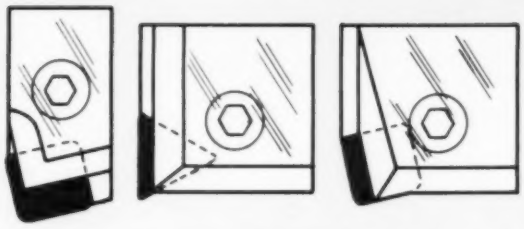
**4** HYDRAULIC TRACER MILLS—*Famco Machine Co, 3100 Sheridan Rd, Kenosha, Wis.* 4-page brochure gives details on the 1½-hp mill and the production-type 2-hp mill with built-in True Trace Control system that simplifies production of die, mold, and cavity work. Famco 100 and 200 vertical milling machines are available with any one of three True Tracer control systems: 1D vertical feed; 2D cross and longitudinal feed; and 3D vertical, cross and longitudinal hydraulic feed. Models illustrated, specifications included.

**5** BALANCING MACHINES—*Gisholt Machine Co, Madison 10, Wis.* 8-page bulletin (Form 1207) illustrates and describes Type HS (bench unit) for very accurate, rapid balancing of small high-speed rotating parts, or assemblies containing high-speed rotating parts. Machine is available in either horizontal or vertical type. Model variations pictured, specifications tabulated, installations discussed.

**6** COIL WINDING MACHINES—*Carl Hirschmann Co, 30 Park Ave, Manhasset, LI, NY.* 6-page brochure covers

*(continued on p233)*

*"Well, his application stated he was unusually fond of animals."*

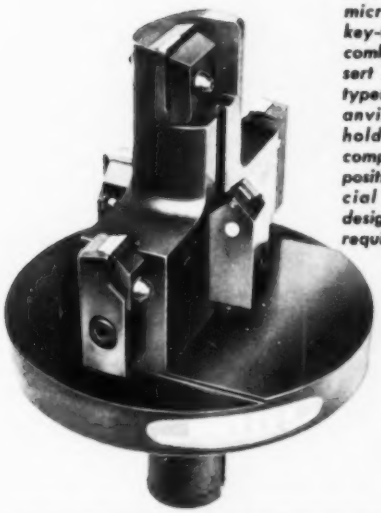


TYPICAL STANDARD WESSON COMPONENTS

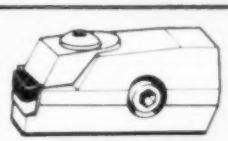
carbide TOOL NEWS

# BUILDING BLOCK TOOLING

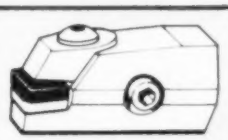
- ***Easier to design for special applications***
- ***Maintained with smaller inventories of parts***
- ***Greater accuracy in production***



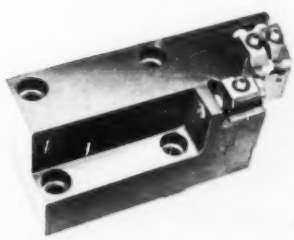
***MULTIPLE-POINT** micro-adjustable and key-type boring quill combines standard insert holders of several types and a standard anvil-clamp unit. To hold these standard components in correct positions, a simple special body has been designed around their required locations.*



TYPICAL TRIANGULAR INSERT HOLDER



TYPICAL SQUARE INSERT HOLDER



***TOOL BLOCKS** can be designed with the same standardized components that are used to bore and chamfer. This tool is used to rough turn and face transmission parts. Standard micro-adjustment units permit rapid setup, and each square insert has eight cutting edges.*

Any time the word 'special' is mentioned to a production engineer, he unconsciously winces. He wants the added production or the better quality that can come with specials but he does not want to have to justify the extra first cost to his boss.

All tools start out as specials but when a market is built up for a particular design, it is standardized. Now, carbide-tool producers are leading the way to greater standardization and to more widespread use of carbides.

Standard components first became normal practice with the introduction of band-type and throw-away insert type holders. The carbide slugs and inserts, and the holders had to have standard dimensions. This was so obvious that nobody recognized what it meant—either to users or producers.

It is difficult to maintain brazed-in cutting points that have to be accurately ground in relation to the tool body and to each other. However, multiple-point throw-away tooling has been used sparingly because it is the most complex of the special tools. But all production engineers recognize the tremendous advantages that are possible when several operations are combined in one tool.

Gradually, carbide throw-aways and slugs have been applied to special multiple-point tools, and the problems of grinding and setting disappeared. It is only necessary to grind off the slug and adjust it or index the insert, and the tool is ready for re-use.

Wesson recognized that most of the special multiple-point tools they were designing were made from just a few types of components. With this recognition, came an intensive investigation to determine how few different components would cover the majority of special-tool needs.

Wesson now has about 20 standardized insert holders (see inset at left) for triangular and square inserts of different sizes, and with positive and negative rakes, few of which are needed in any one tool. They have 4 standardized anvil-clamp units (see examples at top of page) for square and triangular inserts. Standardized micro-adjustable units can be applied to most bars or heads to allow for axial or radial adjustments.

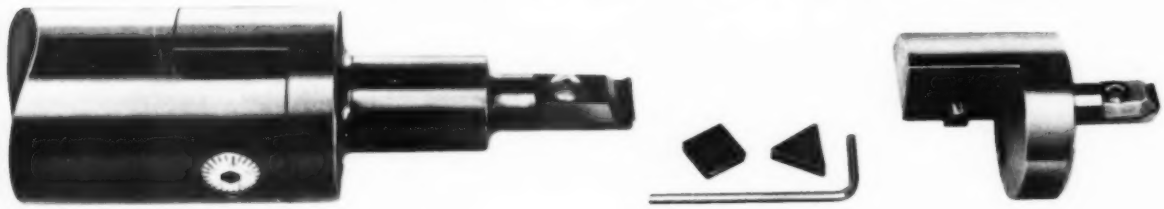
***(continued on next page)***

TOOL carbide NEWS

# Wesson Announces

# NEW INTERCHANGEABLE HEAD BORING BAR

- **Head is micro-adjustable**
- **Boring bar covers range from ½" to 1½" ID**



BORING BAR AND ⅝" HEAD

½" HEAD

Carrying on the 'building-block' idea one step further, Wesson now has designed a micro-adjustable boring bar that can carry interchangeable heads for boring holes from ½ to 1½ inches in diameter. When in the bar, the head can be adjusted ¼ inch on the diameter.

This is the first time that small-hole boring has been possible with a standard throw-away insert tool that can also be used for larger holes. These tools can be maintained easily at the machine because they use standard triangular and square carbide inserts.

## Building Block Tooling

*(continued from previous page)*

Now, the design of a special multiple-point tool is a simple matter. The workpiece and its tolerances set the requirements for the types of inserts, holders, clamps, anvils and adjustments needed. Relationships among the surfaces to be machined indicate the length and breadth of the tool.

It is then only necessary to draw the standard components in space and fill in the special body required to hold the components where they belong. A check of this body is made to be sure of its strength through all sections and then the tool can be made.

Special tools will still be made by carbide-tool producers – this will not lead to do-it-yourself tooling – but the user benefits through lower costs, shorter lead times, smaller inventories of spare parts and the chance to specify special tools wherever they should be used.

# Conventional Carbide Tools Best Bet For Most Jobs

## 1. Band type with carbide slugs

Band-type Wesson Multicut holders are available in 9 specific types with 90 standard sizes available from stock. Holders are designed for square, triangular or diamond (with various lead angles) carbide slugs to turn, face and cut tapers. They are precision made with tempered steel bands, hardened shank and broached holes. Carbide slug can be locked from top or bottom of the holder and many tools can be packed in small areas for multiple operation. Standard Wessonmetal slugs always available from stock and replacement bands that fit can be quickly supplied.

CUTS RIGHT TO LEFT
(LEFT-HAND ALSO AVAILABLE)

tools Wesson carbide Wessonmetal

**WESSON COMPANY, DEPT. AD**
1220 Woodward Heights Blvd., Detroit 20, Mich.

*IN CANADA:*
**WESSON CUTTING TOOLS, LTD.**
93 Judge Road, Toronto 18, Ontario

LITHO IN U.S.A.

## Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

Micafil line. Application and technical data is offered on machines for fine wire layer winding, armature winding, toroidal coil winding, stator winding, strip-on-edge winding, universal rotor treating lathes, and vertical winding machines.

### TOOLS AND ACCESSORIES

**7** JIG AND FIXTURE COMPONENTS—*Northwestern Tools, Inc, 119 Hollier Ave, Dayton 3, Ohio.* 16-page catalog covers over 500 components for jigs and fixtures, and over 250 clamping items. Full scale tracing templets of the jig and fixture components are included.

**8** MEASURING INSTRUMENTS—*Petz-Emery, Inc, Pleasant Valley, NY.* 4-page illustrated bulletin E describes new Pet-line instruments including Model A comparator, adaptable to any dial indicator; Model B, a small, second comparator for bench or portable use; depth gages—two and three-hole models with special spring collet that can be used for mounting dial indicators elsewhere; weighted indicators for checking compressible materials; Jumbo magnetic base indicator support that can be attached anywhere to machine frames for checking purposes.

**9** CENTRALIZED LUBRICATION—*Lincoln Engineering Co, Industrial Division, 4010 Goodfellow Blvd, St Louis 20, Mo.* 16-page brochure explains the role of centralized lubrication and its advantages over manual methods of greasing and oiling industrial machinery. Discusses three areas of plant management where it can effect substantial savings; five practical steps for converting to automatic lubrication; case histories of uses in industry, and detailed application data on basic centralized systems.

**10** ONE-SHOT LUBRICATORS—*Bijur Lubricating Corp, 151 W Passaic St, Rochelle Park, NJ.* 8-page bulletin 3C covers semi-automatic units that can service as many as 100 or more bearings on a machine. Hand-operated, they are designed for use on machines requiring closely controlled but infrequent oiling. Five basic models are described and illustrated with diagrams showing dimensions, reservoir capacities, and discharge volumes of each.

**11** GRANITE SURFACE PLATES—*Herman Stone Co, 1860 N Gettysburg Ave, Dayton 17, Ohio.* 4-page bulletin A is combination catalog and price list

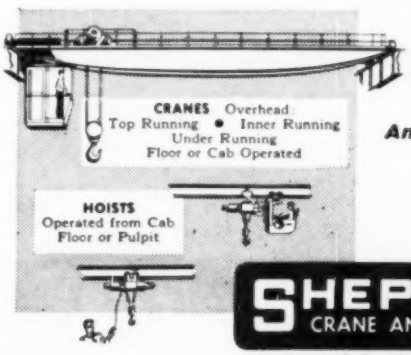
*"Another day, another dollar, minus deductions which brings it down to 23 cents."*


SHEPARD NILES

# Large Industrial Cranes 1 to 450 TONS

**FOR OVER 50 YEARS,** Shepard Niles has been a distinguished name in cranes. A pioneer in the overhead crane industry, Shepard has never failed to modernize and progress through the years. Today its cranes serve thousands of satisfied users, plus an ever-increasing number of new customers.

Shepard offers a complete line of heavy industrial cranes . . . from 1 to 450 tons . . . for light, medium or heavy service. Available for constant or intermittent duty in slow, medium and high speeds; operated from cab or floor. Let a Shepard Niles representative help you select the crane that best fits your plant's load-handling requirements.




• Write for latest Bulletin . . . request a representative to call.

***America's Most Complete Line of Cranes and Hoists Since 1903***

SHEPARD NILES
CRANE AND HOIST CORPORATION
3184 Schuyler Ave., Montour Falls, N. Y.

# WHY Pratt & Whitney MICROHONES Bores In Titanium Spacers

Rotor disc spacers, that are used in jet engines, require accurate bores having consistent surface finish. Thus, the final processing method must generate bores with diametric and geometric accuracies within .0005″ and consistent finishes of 15 microinches.

But, Pratt & Whitney Aircraft Division, U.A.C., faced additional problems in selecting the final processing method for these .110″ length bores in titanium spacers. Because the spacers are manufactured in 20 different heights and bores in two diameters, efficient production demanded extreme versatility of the processing method used.

Here's why Pratt & Whitney chose the Microhoning process and equipment to economically produce the required results: Microhoning, in removing .004″ of stock from each bore, accurately holds to size and finish requirements; and because the fixturing positions all 20 spacer heights at same work level, the tool stroke never needs adjustment. The Microhoning of all 16 bores in each titanium spacer is completed in about 7 minutes (including loading and unloading time).

Learn why Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME _____

TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE _____

**MICROMATIC HONE CORP.**
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN


## Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

on both pink and gray granite plates ranging in size from 8 x 12 in. to 10 x 50 ft. Line of skeleton and cabinet model stands is available for all surface plate applications.

**12** BORESCOPES — *Engelhard Industries, Inc, National Electric Instrument Division, 92-21 Corona Ave, Elmhurst 73, NY.* 12-page illustrated data file describes different types of instruments equipped with the Fontar lens system whose curvatures are correct within a few millionths of an inch. Instruments are used to inspect internal areas of equipment having a point of entry of 0.10-in. dia or larger, giving bright, illuminated close-up vision within any bore, threaded hole, recess, or interior surface to a depth of many feet.

**13** SPECIAL UNITIZED TOOLING—*Tool Products Corp, 377 Old Falls Blvd, N Tonawanda, NY.* 8-page booklet illustrates and describes special adaptations and variations available in unit tooling. Designs can be provided to work in conjunction with standard equipment, or separately, or with other specials. Some of the many shaped punches and dies used in unit tooling are pictured.

**14** COUNTERSINKS AND COUNTERBORES—*Bicknell-Thomas Co, Greenfield, Mass.* 8-page catalog 59 contains data on 3 and 4-flute solid counterbores with interchangeable pilot; machine countersinks; extensions for both. Sizes and dimensions in tabular form.

**15** CARBIDE GRADE SELECTION CHART—*Adamas Carbide Corp, Kenilworth, NJ.* Chart lists industry designations C-1 through C-14 cross referenced with the designations of 15 producers of tungsten carbide. Includes tips on application and procedure as well as suggestions on how to counter effects of edge wear, cratering, chipping, and breakage.

**16** LUBRICATION EQUIPMENT—*Gray Co, 1030 Sibley St NE, Minneapolis 13, Minn.* 16-page catalog covers complete line of automatic, air-powered, and hand-operated equipment. Powerflo catalog section D contains detailed descriptions of GRACO air-powered pumps for handling centralized lubricating systems, and Gun-Fil lubricators for automatic machine bearing lubrication. Includes complete selection of fittings, hose, and accessories.

**17** RADIATION IN INDUSTRY—*Picker X-Ray Corp, 25 S Broadway, White Plains, NY.* 12-page illustrated booklet discusses use of X-rays and gamma rays for nondestructive inspection and product testing. Considers advantages and disadvantages of both; includes examples of current industrial applications of X-ray and radio-isotope machines. Charts show physical, chemical, and biological effects of various dosages.

### HEAT TREATING AND WELDING

**18** TEMPERING FURNACE—*C I Hayes, Inc, 800 Wellington Ave, Cranston 10, RI.* 2-page illustrated bulletin describes design and construction features of the Type D Flexotemp (TM) for use in tempering, annealing, stress-relieving, and precipitation hardening jobs requiring close temperature control. Max temperature is 1250 F.

**19** ARC WELDERS—*Lincoln Electric Co, Cleveland 17, Ohio.* 4-page bulletin 4607.1 pictures and describes Idealarc TM

Models, ac and ac/dc units available in sizes from 300 to 650 amps. Basic machines discussed, plus optional features available. Specifications and ordering equipment included.

**20** WELDING WIRES—*American Chain & Cable Co, Page Steel and Wire Division, Monessen, Penna.* 6-page bulletin DH-402-C covers Page submerged arc and inert gas welding wires. Describes uses of 26 different analyses of stainless steel, low alloy, and mild carbon steel automatic welding wires.

**21** LUMINOUS WALL FIRING—*A F Holden Co, 14841 Schaefer Hwy, Detroit 27, Mich.* 48-page technical bulletin describes company's new luminous wall combustion system for gas-fired, infrared heat treating furnaces. Titled "Instantaneous Heat," it tells what it is, how it works, present and future applications, and includes a glossary of terms.

## PLANT SERVICE EQUIPMENT

**22** PUMPS — *Pioneer Pumps, Detroit Harvester Co, 21800 Greenfield Rd, Oak Park 37, Mich.* 72-page catalog illustrates and describes centrifugal and rotary pumps varying in size from a rating of 1/20 hp to 5 hp. They deliver from 1 pt to 148 gpm, and operate at pressures of from zero up to 54 psi. Pioneer open-impeller centrifugal units in both the sealed and seal-less types are featured, as well as Rollway mechnical positive-displacement rotary models. Descriptions and specifications of pump parts and accessories included.

**23** DUST AND FUME CONTROL SYSTEMS—*Kirk & Baum Manufacturing Co, Cincinnati 9, Ohio.* 52-page catalog describes and pictures 60 different plant installations. Metal-working section covers installations specifically created for buffing, grinding, plating, and heat treating. Wet, dry, electrical, and centrifugal collection are pictured and discussed.

**24** RUST PREVENTION—*Rust-Lick, Inc, 756 Boylston St, Boston 16, Mass.* 20-page booklet presents basic information on rust, its causes, and application of preventives. Factual data included on various types of rust-preventing liquids and recommended uses.

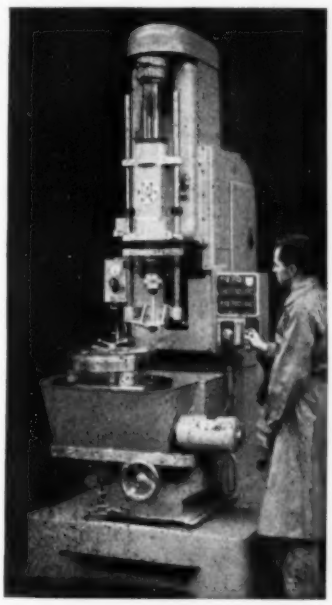
**25** FORK TRUCKS—*Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio.* Condensed catalog contains detailed engineering data, specifications, and operating information on more than 25 basic models. Section covers major attachments.

*(continued on p236)*

*"You're right, Hoskins. A wife shouldn't make more than her husband—we'll cut her salary."*


# HOW Pratt & Whitney MICROHONES Bores In Titanium Spacers

By Microhoning the bores in rotor disc spacers used in jet engines, Pratt & Whitney obtains final stock removal that efficiently produces close diametric and geometric accuracies (within .0005″) and consistent surface finishes of 15 microinches.



Here's how a Hydrohoner produces these accurate results in 20 different sizes of titanium spacers . . . each spacer having 16 bores that are either .680″ or .590″ in diameter and .110″ in length.

The Hydrohoner is equipped with precise feed and sizing controls that automatically expand and collapse the tool, compensate for abrasive wear, and terminate the Microhoning cycle when required bore size is reached. Also, because fixturing is designed to position all spacers at the same work level, the tool stroke never needs adjustment.

A rotary indexing table automatically locates each bore under the spindle and stops the Hydrohoner when all 16 bores in each spacer are finished. A lateral indexing feature positions the fixture to accommodate various spacer sizes. In fixture change-over, no special tools are required for simple exchanging of four details, and the switch from one spacer size to another requires but a few minutes.

☐ Please send me your movie "Progress in Precision" in time for showing on _____ (date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

**MICROMATIC HONE CORP.**
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

Now

# AUTOMATIC POSITIONING

with the

## DIXI 75 horizontal optical jig borer

offers you increased
ACCURACY
VERSATILITY
PRODUCTIVITY

Made in Switzerland
Measurement in inches

- Automatic positioning can be changed instantly to manual operation
- Projected optical setting — direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference
- Simplified controls functionally arranged for greater operating speed and efficiency
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29⅝" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel
- Hydraulic feeds and infinitely variable spindle speeds
- Rear support optional

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York.—Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

**Demonstrations upon request at our conveniently located demonstration centers.**

MBI

**M. B. I. EXPORT & IMPORT LTD.**

A DIVISION OF MACHINERY BUILDERS, INC.
475 Grand Concourse, Bronx 51, N. Y.
"Over 25 years' experience in designing and building machinery."

## Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

**26** HEAVY-DUTY ROTOBLAST BARRELS—*Pangborn Corp, Hagerstown, Md.* 16-page bulletin 705 pictures and describes design features of series with 15, 20, 32, 72, and 102-cu ft barrels. Capacities and dimensions tabulated. T-section extra-heavy work conveyor and new pushbutton door described as well as standard and automatic loader arrangements. Information included on new Rotoblast steel shot, abrasive separator, and special wear plates.

**27** ROTARY POSITIVE AIR AND VACUUM PUMPS—*Leiman Bros, Inc, 102 Christie St, Newark 5, NJ.* 16-page catalog 359 contains data on pumps, gas boosters, and air motors. Includes 2 and 4-vane types; fan-cooled, water-cooled, and new radiator air-cooled models; motor driven units; direct-coupled and belt-driven models; integral pump and motor; automatically controlled tank units. Dimensions, capacities, performance curves, installations, accessories included.

**28** METAL CLEANER—*Oakite Products, Inc, 124 Rector St, New York 6, NY.* 4-page folder describes features of Room-Temp Cleaner designed primarily for use in spray washing machines; compound is most frequently used in temp range of 80 to 100 F. Advantages include long life in solution; ability to retard rusting of steel between operations; safety on steel, aluminum, copper, brass, zinc, and their alloys.

### PARTS AND MATERIALS

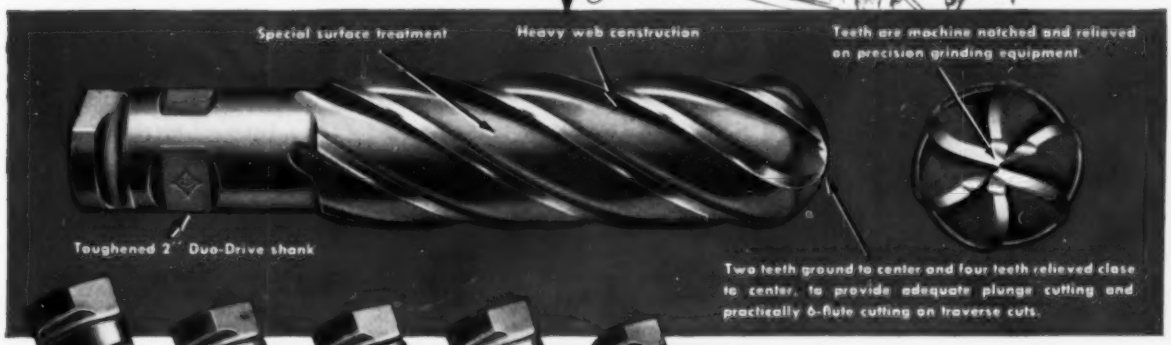
**29** SOCKET SCREW PRODUCTS—*Bristol Co, Waterbury 20, Conn.* 32-page catalog 765 containing new specifications and design standards covers complete product line. Includes unified screw thread tables, tables giving physical properties and dimensional standards, tables listing platings and finishing treatments, and government specifications to which they conform.

**30** INDUSTRIAL AND MOTOR CONTROLS—*B/W Controller Corp, 2211 E Maple Rd, Birmingham, Mich.* 12-page catalog illustrates and describes magnetic contactors, starters and reversing contac-

*"I've gotta run, dear—you know how the guys at the shop kid me when I'm late."*

# NEW
# CLEVELAND
## 6 FLUTE
## HEAVY DUTY END MILLS

- For heavy duty applications which require larger radii in pocket bottoms and corners.
- Can be operated at higher feeds than 2-flute end mills, with less vibration and tooth impact.
- Will remove maximum amounts of metal with a minimum of cutting edge wear.
- Give superior performance in both plunge cutting and traverse cuts.


Special surface treatment
Heavy web construction
Teeth are machine notched and relieved on precision grinding equipment
Toughened 2" Duo-Drive shank
Two teeth ground to center and four teeth relieved close to center, to provide adequate plunge cutting and practically 6-flute cutting on traverse cuts.

2 FLUTE 3 FLUTE 4 FLUTE 6 FLUTE 2 FLUTE

**The complete line of**

**CLEVELAND**

**HEAVY DUTY END MILLS**

**with DUO-DRIVE Shanks**

**For removing the maximum amount of metal at high feed rates, with minimum cutting edge wear.**

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

for CLEVELAND ◇ Quality Tools . . . *prompt delivery from stock*

**THE CLEVELAND TWIST DRILL CO.**

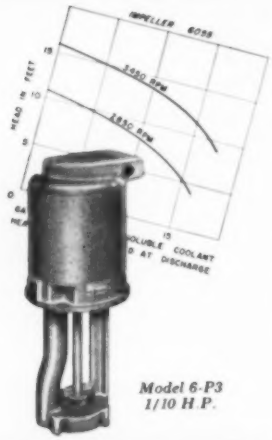
**1242 East 49th Street • Cleveland 14, Ohio**

Stockrooms: New York • Atlanta • Cleveland • Detroit • Chicago • Dallas • Los Angeles • San Francisco

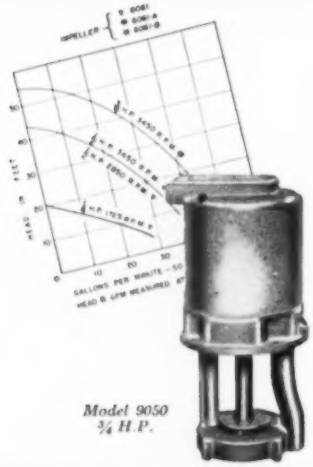
## Machine tool builders know...

### No matter what size...

Yes, there is a Ruthman Gusher Coolant Pump that will exactly fit your coolant pump requirements from the P-3 Series (Baby Gusher) with 1/10 H.P. to the largest 7½ H.P. Series. Gusher Pumps are available in Immersed, Pipe Connected, Flange Mounted and Tank Units.




*Model 6-P3 1/10 H.P.*




*Model 9050 ¾ H.P.*

### You get better results...

You can be sure that Gusher Coolant Pumps will give you year after year of highly satisfactory service. Their simple, compact design reduces maintenance to a minimum and the electronically balanced rotating assembly increases bearing life, cuts vibration and wear.

### with a RUTHMAN

# GUSHER

### COOLANT PUMP

Follow the leading machine tool builders and specify Ruthman Gusher Coolant Pumps on your metal cutting machinery.

*Model 6-P3 Pump in Tank No. 1-4800 equipped with Casters for complete portability*

*Write for our complete catalog today.*

THE Ruthman MACHINERY CO.

1819 Reading Road, Cincinnati, Ohio

- COOLANT PUMPS
- CIRCULATORS • AGITATORS
- MOLTEN METAL PUMPS


## Free Literature

**To order any of these bulletins, circle corresponding number inside back cover.**

tors, together with diagrams of enclosures and dimensions. Also covers starter-relay combinations, combination starters and enclosures, multiple pump controls.

**31** SCREW CONVEYOR DRIVES—*Dodge Manufacturing Corp, Mishawaka, Ind.* 16-page bulletin A667C contains information on a drive complete with speed reducer, packing gland, and drive shaft, all of which mount as a unit on a trough end. Expanded line includes four sizes, each available in three ratios: 18:1 or 8:1 with double reduction gearing, or 3:1 with single. Includes photos, engineering drawings with dimensions, prices, and tables to facilitate selection of units and V-belt drives for various loads and speeds.

**32** PRECISION INSTRUMENT COMPONENTS—*PIC Design Corp, 477 Atlantic Ave, East Rockaway, LI, NY.* 416-page master catalog 20, consolidating all previous catalogs and supplements, lists over 10,000 items, including gears, shafts, collars, couplings, speed reducers, differentials. In addition to drawings and specifications, separate technical data and breadboard kit sections are included.

**33** TITANIUM—*Harvey Aluminum, 19200 S Western Ave, Torrance, Calif.* 36-page booklet discusses advantages; rating chart on corrosion properties, specifications and characteristics of the various titanium alloys outlined. Section on mill products includes design data, weight tables, manufacturing limits, and tolerances. Machining and joining, and current and future applications for the metal are covered.

**34** SOLENOID VALVES—*Aktomatic Valve Co, 545 W Abbott St, Indianapolis, Ind.* 36-page catalog 444 lists over 200 bronze and stainless steel valves for use with pressures from 0 to 10,000 psi and temperatures from -300 to +500 F. They may be used for air, steam, corrosive, and non-corrosive gases and liquids. Detailed specifications, performance data, specific application information, and optional features included.

**35** CARBON STEEL SPECS CHART—*—Peter A Frasse & Co, 17 Grand St, New York 13, NY.* 8½ x 11-in. chart, Sec E, No. 1, shows chemical analysis requirements for 60 most frequently used military and federal specifications. Also listed are specified forms (sheets, bars, etc) and nearest corresponding SAE, AISI, and AMS type numbers.

**36** SMALL MOTORS—*Barber-Colman Co, Rockford, Ill.* 8-page catalog R-1 describes four types of ac shaded pole, reversible, nongeared motors. Gives information on performance characteristics, ratings, construction, dimensions, and typical applications. Special section covers electronic control of B-C reversible motor. Duty cycle data, power source considerations, special features, braking and speed control data included.

**37** ALUMINUM MILL PRODUCTS—*Reynolds Metals Co, Box 1348, Richmond, Va.* 18-page brochure gives complete specifications for the hundreds of alloys and forms available. Covers alloy and temper designations, fatigue and shearing strengths, and various alloys available in foil, sheet and plate, wire, rod and bar, tubing and pipe, and extruded and structural shapes. Fabricating and finishing techniques are summarized.

**38** SOCKET HEAD CAP SCREWS—*Allen Manufacturing Co, Hartford 1, Conn.* 4-page bulletin G-25 provides information on larger-head-diameter hex

socket cap screws called '60 Series that are said to give up to 2-1/3 times more load-carrying capacity without indentation. Head diameter of the sizes from ¼ in. up is now uniformly 1½ times the body diameter, providing more under-the-head bearing surface in many sizes and a proportionate increase in clamping force. Tables of dimension standards, comparisons of head diameter, bearing surface, tensile load to indent soft steel, and other factors.

**39** BRUSH BERYLLIUM OXIDE—*Brush Beryllium Co, 4301 Perkins Ave, Cleveland 3, Ohio.* 12-page booklet describes properties, chemical analysis and applications of UOX beryllium oxide, a new high purity, sinterable grade of the stable, high temperature refractory oxide of beryllium.

**40** VIBRATING SCREENS — *Link-Belt Co, Prudential Plaza, Chicago 1, Ill.* 48-page book, No. 2777, provides information on 12 different types in 212 sizes, plus data on screen cloths and accessories. Tables of materials, selection data; construction features illustrated.

**41** MANUAL STARTERS—*Furnas Electric Co, 1044 McKee St, Batavia, Ill.* 8-page illustrated bulletin 11B1 provides information on complete line; covers design, dimensions, ratings and prices. Starters described are rated through 7½ hp ac and 2 hp dc.

**42** CARBON BRUSHES—*Superior Carbon Products, Inc, 9115 George Ave, Cleveland 5, Ohio.* 8-page brochure is aimed at getting the most out of carbon brushes. Purpose and function discussed; brush wear and chatter covered; classification of various brush grades detailed.

**43** MERCURY SWITCHES—*Micro Switch, Division of Minneapolis-Honeywell Regulator Co, Freeport, Ill.* 12-page catalog 90B describes standard line. Includes photos, dimensions, electrical ratings, drawings, application information, and technical data.

**44** MOLYBDENUM AND MOLYBDENUM-TITANIUM ALLOYS—*Universal-Cyclops Steel Corp, Refractomet Division, Bridgeville, Penna.* 24-page pricing schedule also contains general information

*"Only one thing prevents me from trying to repair this equipment—my good judgment!"*

**You can keep**

# 2365

## BEARINGS AND BARS IN YOUR DESK DRAWER

*Let your local Bunting Distributor* carry your bearings inventory. Hundreds of Bunting Distributors and Eleven Bunting Branches supply from stock the most advanced, highest quality bearings, completely machined and finished, at low cost anywhere in America.

**. . . where to get them**

Your Bunting distributor is listed in the classified section of your telephone directory usually under Bars — Bronze, and Bearings — Bronze. Two Bunting factories and eleven Bunting Branch Warehouses expedite distribution in all areas. Ask your local Bunting distributor or write for catalogs.

**. . . made to blueprint**

Bunting offers unmatched engineering and manufacturing facilities for special bearings and parts of Cast Bronze and Sintered Oil-filled Metals.

The Bunting Brass and Bronze Company
Toledo 1, Ohio EVergreen 2-3451

*. . . ask or write for your copy of . . .*

Bunting's "Engineering Handbook on Powder Metallurgy" details manufacture and use of sintered metal bearings and parts.

CATALOG NO. 58 listing...866 sizes of Bunting Cast Bronze Standard Stock Bearings.

667 sizes of Bunting Sintered oil-filled Bronze Stock Plain, Flange and Thrust Bearings. Made to ASTM Standards.

267 sizes of Bunting Cast Bronze Tubular and Solid 13" Bars.

84 sizes of Bunting Sintered oil-filled Bronze Tubular and Solid 6½" Bars.

BAR CARD 40 listing . . . 138 sizes of Bunting Bearing Aluminum 13" Bars.

CATALOG NO. 258 listing...343 sizes of Electric Motor Bearings for all makes and sizes of electric motors from 1/50 to 100 HP.

# Bunting®

BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE OR SINTERED METALS. ALCOA® ALUMINUM BARS.

# ...use LARGER DIE SETS

on this

# New 40 Ton

## PRESS-RITE O.B.I. PRESS

ALL STEEL FRAME that is heavily reinforced at all vital points for maximum rigidity makes possible more generous ram area, large bed area and extra depth of throat.

Many jobs such as die cast trimming, electronic work, etc., that has been run on larger presses can now be put on this NEW 40 Ton PRESS-RITE O.B.I. Press with its extra die space.

STANDARD FEATURES include 3" stroke, patented PRESS-RITE automatic brake, 4 point sliding key clutch and built-in cam operated single stroke safety mechanism.

OPTIONAL FEATURES include longer or shorter stroke, greater shut height, back gearing, PRESS-RITE Airflex Air Friction Clutch and others.

**PLOT Your Way to BIGGER PROFITS.**

Use this FREE Profit Plotter to compare present stamping costs with the cost for the same job on the right HAVIR, (formerly Diebel) Hi-Production Automatic Press.

Write for your "Profit Plotter" copy TODAY.

PRESS-RITE O.B.I. Models from 2 Ton to 85 Ton HAVIR (Formerly Diebel) Hi-Production Automatic Models from 5 Ton to 150 Ton.

*Ask your PRESS-RITE Dealer for details or write:*

**PRESS-RITE DIV.**

*Sales Service Mfg. Co.*

2361 University Ave., St. Paul 14L, Minn.


## Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

including tolerances, tables of weight, products available.

**45** NONFERROUS ALLOYS—*Shenango Furnace Co, Cast Products Division, Dover, Ohio.* 8-page bulletin 157 contains a detailed alloy chart showing comparative specifications, chemical analyses, and the minimum physical properties of Shenango nonferrous alloys. Also illustrates and describes a broad range of component parts and assemblies produced by the centrifugal method. Castings are available in range of metals including tin bronzes, aluminum bronzes, manganese bronzes, brass, silicon bronzes, special alloys, Monel Metals, and Ni-Vee Bronze.

**46** CHEMICAL MILLING OF STEEL AND "SUPER" ALLOYS — *US Chemical Milling Corp, 1700 Rosecrans Blvd, Manhattan Beach, Calif.* Design bulletin No. 8 describes recent advances in the process of chemically milled steel alloys. Provides information on the effects of heat treating, surface finishes and tolerances, effect on physical properties, and a list of the many steel alloys and other super hard metals that can now be chemically milled.

**47** V-BELT DRIVE DESIGN — *Gates Rubber Co, 999 S Broadway, Denver 17, Colo.* 32-page catalog DH-900 provides complete design information for drives utilizing Super HC V-belts in three new cross sections along with a new line of Super-V sheaves. Drive tables featuring complete range of sheave diameters and belt lengths show how to handle both stock and non-stock drives with the new belt.

**48** SERVO MOTORS—*John Oster Manufacturing Co, Avionic Division, 1 Main St, Racine, Wis.* 20-page catalog 5000 lists and describes all basic models of complete line in sizes 8 to 29. Includes dimensional drawings, and physical, electrical, and mechanical characteristics.

**49** TORQUEMETERS — *Metron Instrument Co, 432 Lincoln St, Denver 3, Colo.* Illustrated bulletin describes Series 85 for measuring dynamic torques. Units will cover ranges from 5 to 250 oz-in. full scale on shafts turning from 50 to 12,000 rpm. Accuracy is within 2% of full scale.

*"Since you two haven't been on speaking terms we've been getting a lot more work out!"*


# Don't replace TROUBLE with TROUBLE

Replace with a

# GRAYMILLS Superflo COOLANT PUMP

**NO BELTS..NO SEALS or PACKING NO ALIGNMENT or PRIMING PROBLEMS**

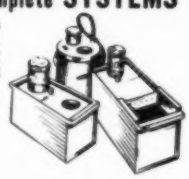
Get years of dependable, smooth, quiet performance, with abundant volume, at less cost and practically no maintenance. Graymills Pumps are stocked by Industrial Distributors.

**Superflo PUMPS ONLY**

Easily mounted in Machine Tool Sumps, 50 standard models, can be used with liquids bearing abrasives. Centrifugals for high, volume, Gear Pumps for high pressures. Interchangeable.

**or complete SYSTEMS**

with standard tanks from 2 gal. to 38 gal. capacity, 1/25 to 2 H.P. Standard and JIC Models.



**SEND FOR CATALOG 56**

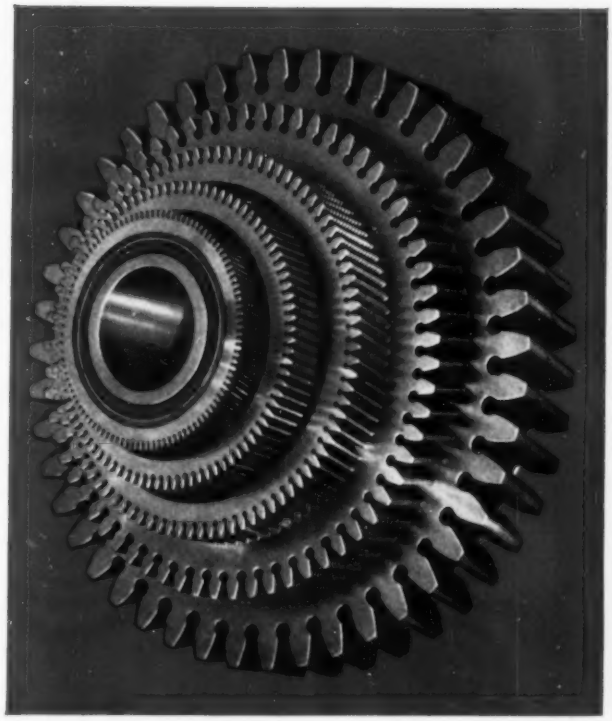
GRAY-MILLS

**GRAYMILLS CORPORATION**

3707 N. LINCOLN AVE.
CHICAGO 13, ILLINOIS

1ST

# WHY RED RING GEAR SHAVING CUTTERS DO SUCH AN EXCEPTIONAL JOB



- Here are some of the reasons for the accuracy, for the job performance and the long economical service life of Red Ring Shaving Cutters.
- These cutters are engineered and produced by skilled specialists who have, for the past 27 years, devoted full time to shaving cutters, exclusively. Never underestimate this vast fund of experience which is unmatched anywhere else in the field.
- All Red Ring cutter grinding and cutter inspections are carried on in temperature controlled departments, for maximum precision. Where else is this done?
- Every Red Ring Cutter is made from a controlled specification forging—proper grain flow and uniform distribution of carbides in the tooth zone.
- Every Red Ring Cutter is heat treated in Red Ring furnaces under the direct control of Red Ring metallurgists.
- Every new cutter design is given a thorough performance try out in the Red Ring Gear Laboratory before it is released.
- Red Ring cutter engineers and service specialists are always available for consultation and to help a cutter customer in an emergency.

When you buy cutters, take advantage of these extra benefits. There is no extra cost.

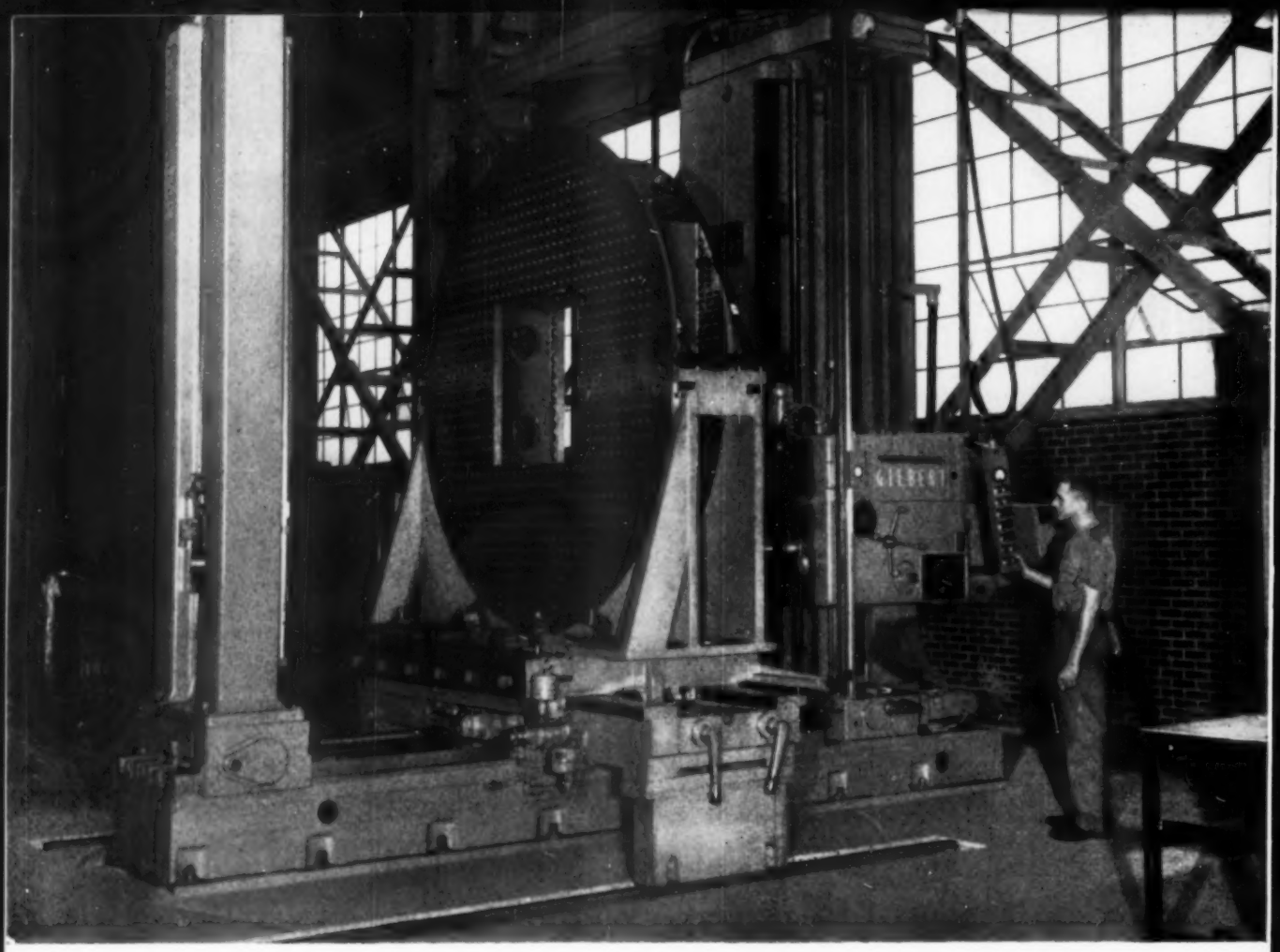
SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING,
GEAR HONING AND ELLIPTOID

8263

**NATIONAL BROACH & MACHINE CO.**

5600 ST. JEAN • DETROIT 13, MICHIGAN

*WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT*




Courtesy Combustion Engineering, Inc.

# Combustion Engineering uses Gilberts for precision boring on atomic reactors

It takes an unusual boring mill (specifically, a Cincinnati Gilbert) to meet the specifications on this job:

(a) diameters within .001",

(b) parallelism of center line of holes to center line of plate within .0001" per inch,

(c) parallelism of flat surfaces within .010",

(d) 32 R.M.S. surface finishes.

These are some of the machining requirements on this part for a fast breeder reactor built in the Chattanooga plant of Combustion Engineering, Inc., pioneer manufacturer in the nuclear field. They are typical of the quality of work assigned to this Cincinnati Gilbert table type horizontal boring mill. Automatic positioning makes work-handling fast and precise.

A number of other Gilbert boring mills are producing similar close-tolerance work for Combustion Engineering—proof that "those who buy Gilbert buy Gilbert again."

New Bulletin 1157 will show you why Gilbert boring mills do so many things so well.

*The Cincinnati Gilbert Machine Tool Co., 3340 Beekman Street, Cincinnati 23, Ohio.*

*those who buy* **GILBERT** *buy Gilbert again*

CIRCLE 348 READER SERVICE CARD

**Francis L Dabney,** vice president and secretary of the Bullard Co, Bridgeport, Conn, has been elected executive vice president

**Vernon L Loofboro,** general manager of Gardner Machine Co, Beloit, Wis, has been appointed executive vice president of the company

**Wilfred E Walton** has been elected vice president of American Machine & Foundry Co, DeWalt Division, Lancaster, Penna. He will continue to direct all engineering operations at DeWalt

# NAMES IN THE NEWS...

**Harry H Whittingham** has been named president and general manager of the Long Manufacturing Division of Borg-Warner Corp, Chicago. He was formerly executive vice president and assistant general manager of the division.

**Clifford D Dernier** has been appointed plant manager of GM's Cadillac-Cleveland Ordnance Plant. Formerly general superintendent, he replaces **Harold R Boyer,** named director of military products for GM.

**Wayne Ewing,** president of Arrowsmith Tool & Die Co, Los Angeles, has been elected president of the American Society of Tool Engineers. New vice presidents are **H Dale Long,** president of Scully-Jones Co, Chicago; **William Moreland,** vice president, manufacturing, F E Myers & Bro Co, Ashland, Ohio; **David A Schrom,** works manager, Grantley Works, York Division, Borg-Warner Corp, York, Penna; and **Philip R Marsilius,** executive vice president, Producto Machine Co, Bridgeport.

**Michel Biscayart** has been elected president of E W Bliss Co-Paris. Mr Biscayart joins Bliss-Paris after 30 years' association with the Norton organization, the last 13 of which were with Norton Behr-Manning Overseas, Inc.

**Clarence J Cadieux** has been named controller of National Twist Drill & Tool Co, Rochester, Mich, succeeding **Arthur L Norton** who has retired. Mr Cadieux will continue to serve as assistant treasurer.

**Andrew H Leingang,** sales manager of East Dayton Tool & Die Co, has been elected vice president, manufacturing, and director of sales.

**Dr George A Roberts,** vice president, technology, Vanadium-Alloys Steel Co, has been re-elected president of the Metal Powder Industries Federation. **Byron B Belden** of Baldwin-Lima-Hamilton Corp has been re-elected president of the Powder Metallurgy Equipment Association. **Charles E Hanson,** Plastic Metals Division, National-US Radiator Corp, has been named president of the Metal Powder Producers Association. **Benjamin J Falk,** Arnold Engineering Co, is new president of the Metal Powder Core Association. **William W Garstand** of Allen-Bradley Co, has been named president of the Ferrite Manufacturers Association.

**J Allan MacLean** (left) has been elected president of Dodge Manufacturing Corp, Mishawaka, Ind, succeeding **Joseph E Otis,** named board chairman. Mr MacLean, a director of Dodge since 1956, was formerly group executive and general manager of Bendix Products Division of Bendix Aviation Corp

**Kenneth A Henn** has been appointed to the new post of domestic sales manager of Jones & Lamson Machine Co, Springfield, Vt. He was formerly manager of the Detroit office

# Fact:

*What you want* are more quality threads per cutting tool dollar—not cheaper tools. Hanson-Whitney's *complete* line of standard taps, gages and cutters give you just that – complete uncompromising quality. *What you want* is consistent production with "free-cutting" action tools—not production variables. Consistent quality of Hanson-Whitney's standard tools reduce costly variations which can affect your profit dollar.

## *Complete and Related* "STANDARDS"

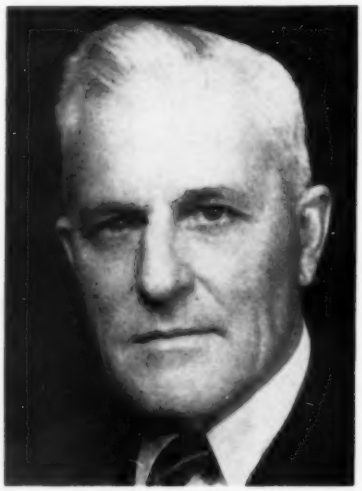
*What you want* is a single source for standard threading tools and gages. It's *fact*, not fiction, that your Hanson-Whitney distributor is the single source for these *quality tools*. *What you want* is a source for complete and related threading service. Your Hanson-Whitney distributor is the threading specialist providing these services—backed up by Hanson-Whitney's forty years of thread engineering and experience.

Hanson-Whitney
COMPANY

205A BARTHOLOMEW AVE., HARTFORD, CONN.

STANDARD: Taps • Thread Gages • Cutters • Fine Pitch Gear Hobs


## NAMES IN THE NEWS...



**Fred L Chapman** (top), vice president, sales, of Gisholt Machine Co, Madison, Wis, has retired after 30 years of service with the company. **Harvey A Waddell**, treasurer, has been elected secretary and a member of the board

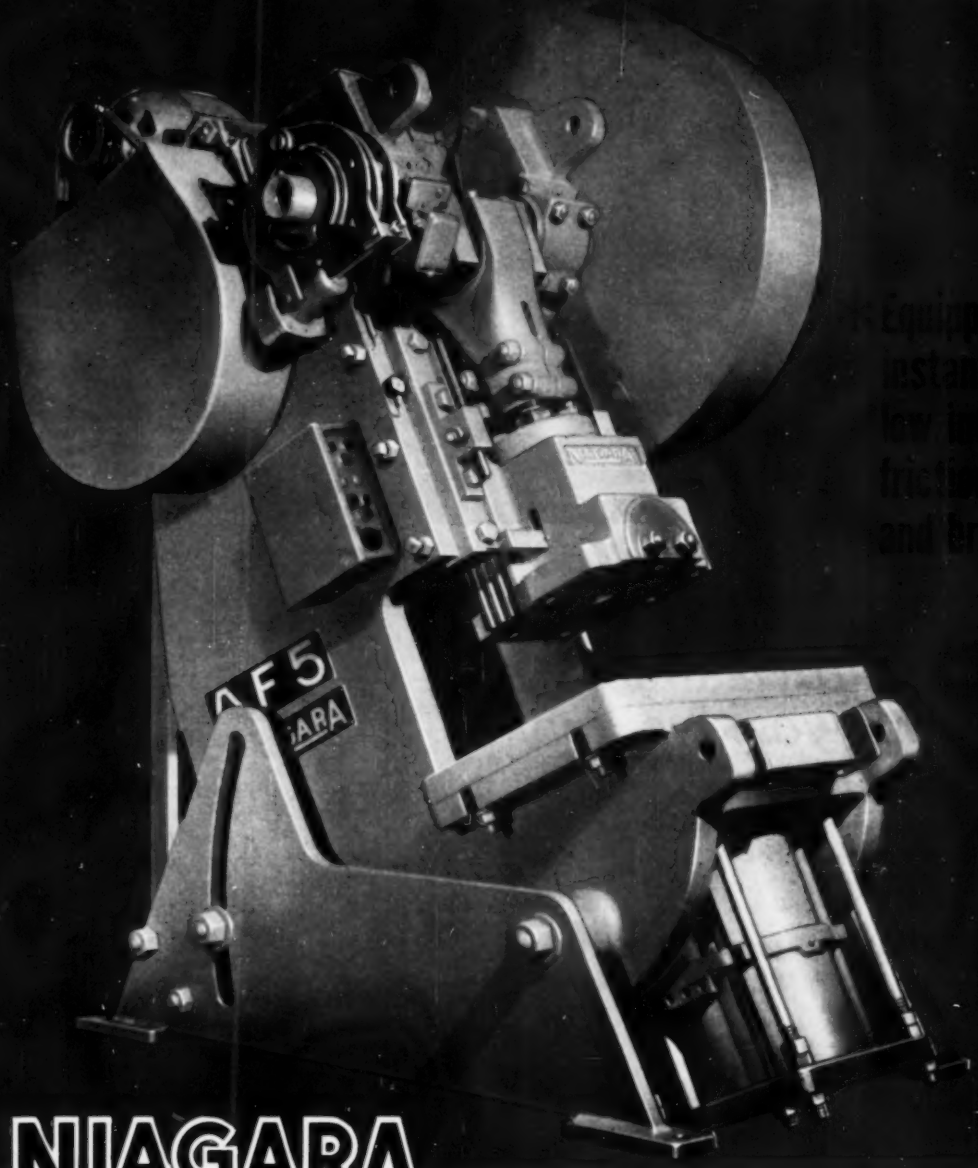
**Edwin R Stroh** has been appointed to the new post of vice president and director of sales for Electric Auto-Lite Co, Toledo. He was previously vice president and automotive sales manager for the Holley Carburetor Co.

**William Paul Novack** has been named supervisor of manufacturing engineering at Packard Bell Electronics' Technical Products Division. Mr Novack was quality control supervisor for the Foster Transformer Co, Cincinnati, before joining Packard Bell.


CIRCLE 349 READER SERVICE CARD

CIRCLE 350 READER SERVICE CARD ►

# A GREAT NEW LINE* JOINS NIAGARA'S BIG OBI FAMILY



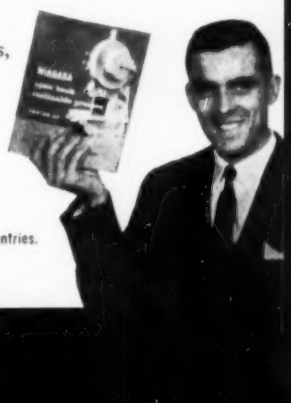

## NIAGARA

Meet the new Series AF. Look it over . . . typical Niagara engineering from crown to base . . . every detail a benefit to you.

- Rugged, rigid frame for greater accuracy, longer die life.
- Unusually long, rigid slide of unique design prevents deflection of ways, solidly supports dies and extends their life.
- Exclusive multiple "V" gibbing for more guiding surface and greater resistance to off-center loads.
- Cool-running, long-wearing, pneumatic friction clutch and brake operate directly on the crankshaft . . . fewer parts to start and stop . . . faster engagement.
- Modern, rigidly supported gearing runs in sealed oil bath for long life.
- Simplified control for safer, time-conserving press operation.
- Patented one-man inclining mechanism.
- Full complement of accessories to meet your specific needs.

Look at the range: 14 sizes, geared and non-geared, shaft diameters 1¼" to 7½", capacities 5½ to 250 tons.
Niagara Machine and Tool Works, Buffalo 11, N. Y.

***Now get the whole story . . .***
***Send for New Bulletin 55.***



DISTRICT OFFICES: Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia / Distributors in principal U.S. Cities and major foreign countries.

# THIS IS A DRILL JIG

## THE FASTEST, LOWEST-COST DRILL JIG IN METAL WORKING TODAY

**Using tape controls to cut tooling costs is a fact.**

**Ask us to prove it. We will program your parts and demonstrate.**

**Details and photographs of a variety of parts, compared with conventional machining costs, are available on request. Growing savings and greater profits from new applications are coming in every day.**

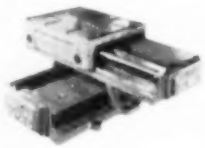
### The Complete Standard System

The DIGIMATIC* MODEL 202 Control System includes all equipment necessary for numerical control of point positioning operations.

- **Special Punch Tape Preparation Unit** that is as simple to operate as an adding machine. No complicated computer language to learn.
- **Control Console**—a compact unit, operator-maintained, with shop-proven reliability.
- **Servo Table**—adapted to drilling machines in one day. Automatic positioning on ball bearing ways. Anti-backlash lead screws.

Write for free 12-page booklet "DIGIMATIC MODEL 202." Also—movies shown at your shop or plant on request.

Tape Unit



Table

Control Console

*DIGIMATIC IS OUR TRADEMARK

**STROMBERG-CARLSON**
A DIVISION OF GENERAL DYNAMICS CORPORATION
1491 N. GOODMAN STREET • ROCHESTER 3, N.Y.

S-C | GD


## NAMES IN THE NEWS...

**Alfred C Harris** has joined Commercial Shearing & Stamping Co, Youngstown, as manager of sales, Rotoform Products. Mr Harris was formerly sales manager of Cincinnati Milling Machine Co's Metal Dynamics Div

**L R Jeffrey Jr** has been elected president and general manager of National Ultrasonic Corp, Irvington, NJ, specialist in the design and production of ultrasonic cleaning and testing equipment. He was formerly vice president of Alcar Instruments, Inc.

**Charles F Netzler** has been appointed assistant sales manager of F J Littell Machine Co, Chicago. He will remain in charge of the Cleveland office and will continue active coverage of the Ohio area.

**John Liu** has been appointed associate director of research and development at Clearing Division of US Industries, Inc. **Vincent J Mankowski** has been named assistant director.

**Lewis A Greene** has been made purchasing manager of Aeroquip Corp's Jackson Division, Jackson, Mich. He has been associated with the purchasing department since 1951.

**Herbert A Elion** is president of the new firm of Elion Instruments, Inc, Bristol, Penna. Company manufactures ultrasonic transducers, electron spin resonance equipment, and X-ray microanalyzers. **Robert J Zeigler** has been appointed vice president and chief engineer. Mr Zeigler was formerly affiliated with RCA manufacturing.

**B Raymond Sayer** has been appointed manager of the Austin Co, Ltd, Montreal and Toronto affiliate of the Austin Co, Cleveland.

**Glenn F Whiteley** has been appointed manager of the Bridgeport, Conn, plant of Heppenstall Co. He succeeds **Edward W Moffitt** who has been transferred to the Midvale-Heppenstall Co facility in Philadelphia. Mr Whiteley has been serving as manager of the Indianapolis plant.

**Raymond H Wadsworth** has been made head of the mechanical engineering department of Teleprompter Corp, NY. Prior to joining the company he was associated with the Manhattan Gear & Instrument Co, Brooklyn, as general manager and chief engineer.

**Leslie F Schurck** has been appointed director of industrial engineering, Cooper Alloy Corp, Hillside, NJ. Before joining the company Mr Schurck was associated with the Fairchild Engine Division of Fairchild Aircraft Co as chief industrial engineer.

**Edison M Uhls** has been appointed southwest district manager for the Disston Division of H K Porter Co, Philadelphia. Formerly district manager of the Quaker Rubber Division, he replaces **Dietz Lusk,** who has resigned.

**E R Humann,** president of Airco Co International, the export division of Air Reduction Co, NY, has been appointed director of purchases for the parent company. **J G Bell,** International's sales manager, succeeds Mr Humann as president of that division.

**Richard H Koehler** has been appointed general sales manager of the Le Roi Division of Westinghouse Air Brake Co, Milwaukee, Wis. Formerly on the staff of the president of Westinghouse at Pittsburgh, he succeeds **Jack E Heuser** who has resigned.

**Leonard R Schaffer,** president, Mechanical Art Works, Newark, NJ, has been elected president of the National Screw Machine Products Association

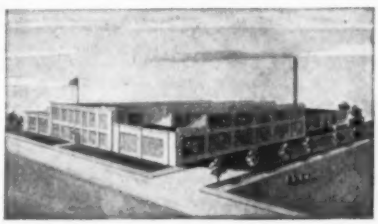

# CDT can help you cut costs

**CDT CAN INCREASE YOUR PRODUCTION**
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

**CDT CAN IMPROVE YOUR QUALITY**
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

**CDT CAN LOWER YOUR PRODUCTION COSTS**
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



**FREE:** *New brochure listing facilities, equipment, etc. Write today.*

**Columbus Die-Tool**
**AND MACHINE COMPANY**
P.O. BOX 750 • COLUMBUS, OHIO
*ESTABLISHED 1906*

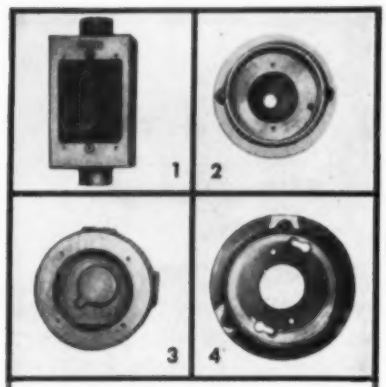
*Designers and manufacturers of* JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

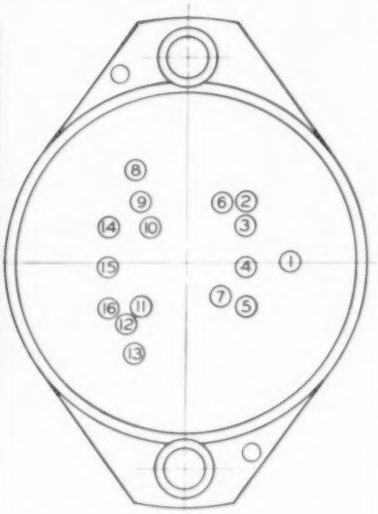



CIRCLE 352 READER SERVICE CARD

# Get Adjustable Head Flexibility with ZAGAR Fixed Center Heads for Drilling, Reaming and Tapping

- ***ADD SPINDLES***
  AT REDUCED COST PER SPINDLE
- ***INCREASE PRODUCTION***
  AT REDUCED COST PER PIECE




***PART 1:*** Spindles 3, 4, 5, 14, 15, 16
***PART 2:*** Add Spindles 2, 7, 10, 12
***PART 3:*** Add Spindles 9, 11
***PART 4:*** Add Spindles 1, 8, 13

When 16 Spindles to Produce 4 Pieces Are Used—

- Cost Per Spindle
  **REDUCED 50%**
- Cost Per Piece
  **REDUCED 66%**

This simple illustration proves Zagar's point — that production is in direct proportion to number of spindles used. With the Zagar *gearless* principle, holes on any center can be drilled, reamed or tapped. With fixed center heads, you eliminate many hazards of drilling by other methods. Yet you get a flexibility unmatched by any other equipment.

*Write for cost details on print "A-S".*

**ZAGAR, INCORPORATED**
23886 LAKELAND BLVD.
CLEVELAND 23, OHIO

Zagar
**TOOLS FOR INDUSTRY and SPECIAL MACHINERY**


# NEW BOOKS...

1958 BOOK OF ASTM STANDARDS—*Published by the American Society for Testing Materials, 1916 Race St, Philadelphia 3, Penna. 10-part set, 13,600 pages. Price, complete set, $116*

This well known reference work, increased from seven to ten parts (available separately) in 1958, contains 2450 standard specifications, methods of test, definitions of terms, and recommended practices. Each part is complete with a detailed subject index and a list of standards in numeric sequence. In order to keep the book up to date, supplements will be issued to each part late in 1959 and 1960. Those volumes of particular interest to metalworking are:

*Part 1. Ferrous Metals Specifications (Except Test Methods) 1620 pages, 291 standards, $12*

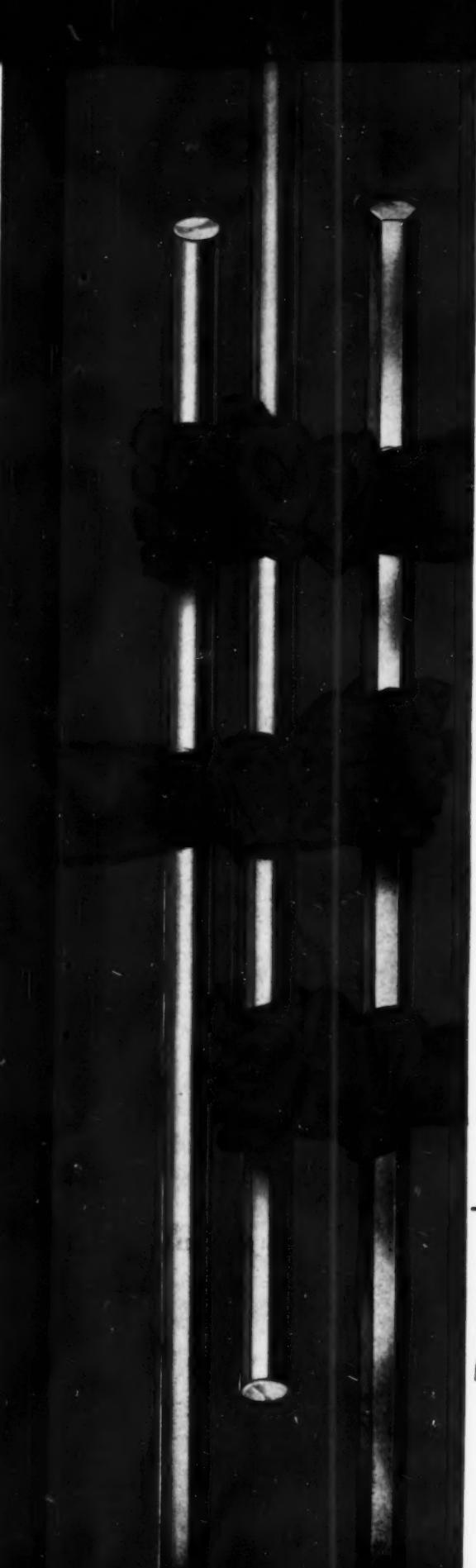
Steel (both carbon and alloy); structural and rivet; boiler and pressure vessel steel plates; concrete reinforcement; commercial bar; hot and cold finished bars; welding electrodes, rods; bearing steel; sheet and strip; rails and track accessories; springs and spring wire; billets, forgings, blooms, axles; wheels and tires; castings; chain; bearings; bolting, pipe fittings; pipe and tubing; zinc and lead-coated steel articles; wrought iron; cast iron; malleable iron; ferro-alloys; and metal powder products.

*Part 2. Non-ferrous Metals Specifications (Except Test Methods), Electronic Materials, 1380 pages, 251 standards, $10*

Aluminum and aluminum-base alloys; aluminum wire, rods, and standard conductors for electrical purposes; magnesium and magnesium alloys; zinc and zinc alloys; cop-

*"Lend me a hand, he says . . . it ends up he reads the blueprints and I do the work. . ."*


CIRCLE 353 READER SERVICE CARD
CIRCLE 354 READER SERVICE CARD ►



An announcement of interest to manufacturers of steel parts

# Improvements in today's STRESSPROOF STEEL BARS WITH COPPER

**1** **100,000 PSI YIELD STRENGTH** in all sizes . . . without heat treating.

**2** **IMPROVED PHYSICAL PROPERTIES**... better fatigue life wearability, and resistance to atmospheric corrosion. Over-all quality is improved.

**3** **IMPROVED MACHINABILITY**... STRESSPROOF with copper now machines faster and better than ever. It gives longer tool life, better finish, and more production from a day's run, according to shop production records.

**4** **CLOSER TOLERANCES**... Tolerances for rounds have been tightened to meet the need for more precise parts as follows:

| ¼" to 1½" | Over 1½" to 2½" | Over 2½" to 3⅜" |
|---|---|---|
| +.000<br>−.004 | +.000<br>−.005 | +.000<br>−.006 |

**5** **COMPARED WITH OTHER STEELS, STRESSPROOF COSTS EVEN LESS TODAY**... Also saves machining and heat treat costs, and you get a better quality part. It will pay you to take another look at this improved material.

Your STEEL SERVICE CENTER stocks contain today's STRESSPROOF. It has been produced and shipped over a several months' period.

---

JUST PUBLISHED! Use this coupon to request your copy of new bulletin, "Improvements in Today's STRESSPROOF Steel Bars."

La Salle STEEL COMPANY

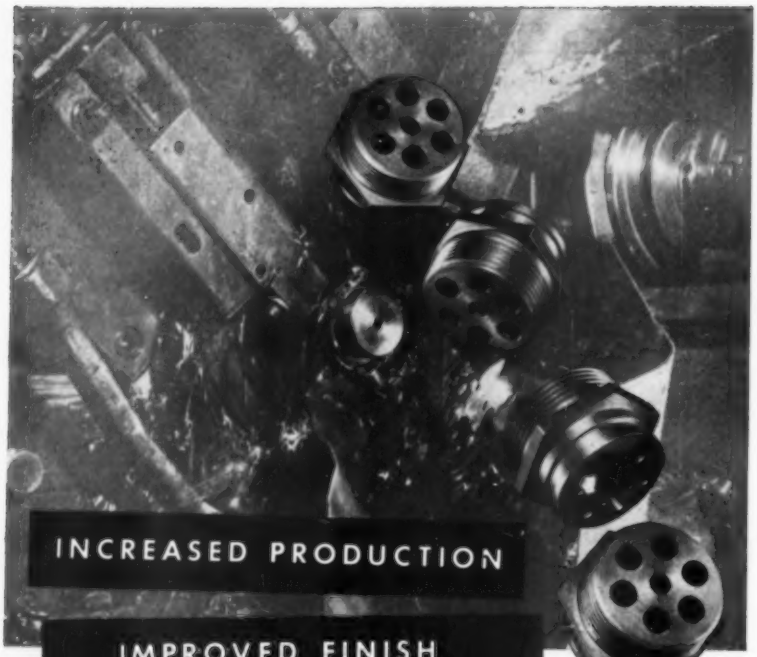
1416 150th Street, Hammond, Indiana

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____




YOU'LL ENJOY ALL
*These* SAVINGS
WITH

# WYCKOFF
## LEADED STEELS

AVAILABLE IN A.I.S.I. ANALYSES
CARBON AND ALLOY STEELS

SPECIALISTS IN COLD FINISHED STEELS EXCLUSIVELY

WYCKOFF STEEL COMPANY

GENERAL OFFICES:
Gateway Center, Pittsburgh 30, Pa.
*Branch Offices in Principal Cities*
Works: Ambridge, Pa., Chicago, Ill., Newark, N.J., Putnam, Conn.

OUR CONSTANT RESEARCH PROGRAM IS YOUR BEST GUARANTEE OF QUALITY CONTROL

WYCKOFF STEEL PRODUCTS • Carbon, Alloy and Leaded Steels • Turned and Polished Shafting • Turned and Ground Shafting • Large Squares • Wide Flats up to 12¾" x 2¼" and 14" x 1¼" • All types of Furnace Treated Steels including Carbon Corrected Steels

per; copper and copper alloy wire and conductors; copper and copper alloy castings; copper alloy wire rods, bars, shapes; copper alloy pipe and tubes; copper and copper alloy plate, sheet, strip; die castings; lead and lead alloys; nickel and nickel alloys; lead and tin-base alloys; titanium; solder and bearing metal; zinc; deoxidizers; electrical-heating and resistance alloys; metal powder products; electrical contact materials; electrodeposited coatings; materials for electron tubes, electronic devices and lamps.

•

STANDARDS PUBLISHED BY ASME — *Available at $1.50 per copy from American Standards Association, 70 E 45th St, New York 17, NY, or from the American Society of Mechanical Engineers, 29 W 39th St, New York 18, NY*

**Forgings**—ASA Y14.9-1958, approved by the American Standards Association, Section 9, Forgings, is one of 17 sections of the American Drafting Standards Manual which, when completed, will provide the means for uniform drafting practices throughout the US and most of the other English-speaking countries. A forgings drawing is used mainly for making the forging die and checking the finished drawings.

**Plastics**—ASA Y14.11-1958, is Section 11 of the ADSM. Purpose is to indicate basic preferred design and drafting practices specifically related to parts formed of plastic materials. To assist the designer and draftsman in the delineation of plastic drawings, a brief discussion of materials and manufacturing processes and operations has been included in the standard together with design and drawing hints for parts formed from plastics of the molding and laminating types. No attempt has been made to cover over-all product design.

**Knurling**—ASA B5.30-1958 (a revision of B5.30 published in 1953) standard covers knurling tools with standardized diametral pitches. It includes dimensional relations with stock in the production of straight, diagonal, and diamond knurling on cylindrical surfaces which have teeth of uniform pitch parallel to the axis of the cylinder or at a helix angle not exceeding 45° with the axis of work. Tooth depths for diagonal knurls have been added to the standard. Tools and applications covered are applicable to both general purpose and precision knurling.

**Standard Graphical Symbols for Fluid Power Diagrams**—ASA Y32.10-1958 is a national standard to be used on hydraulic and pneumatic circuit diagrams for fluid power systems. A fluid power system is defined as one that transmits and controls power through use of a liquid or gas within an enclosed circuit. Shows basic symbols, describes principles on which these symbols are based, illustrates some representative composite results. Composite symbols can be devised for any fluid power component by combining basic symbols

**Butt-Welding Ends** — *Available for $1.* ASA B16.25-1958 covers the preparation of butt-welding ends of pipe, valves, welding neck flanges, and pipe fittings, but is equally applicable to other piping components which are connected into the piping system by butt-welding. Includes requirements for re-entrant shapes for heavy wall ends, welding bevel profiles, inside contours for joints made with or without backing rings, and machining dimensions with their tolerances. When a backing ring is desired, it is recommended that the material of the backing ring be compatible with the chemical composition of the pipe, valve, fitting, or flange with which it is to be used.

**Plain Washers** — *Available for $1.* ASA B27.2-1958 is revised edition covering metal rings used in machinery, automobiles, and household items. Included for the first time are Type B washers which have a more rigidly controlled tolerance in all dimensions than the usual washers designated Type A, and are meant

*"Sorry I'm late, but I had to clean up a labor dispute at home!"*


MICRO MILLING STAINLESS TO .001"
WITHOUT SHEET DISTORTION

SUPER-SPEED POWER QUILL

Where all other types of tools and equipment had failed, a PRECISE Super-Speed POWER QUILL—mounted on a standard machine tool—solved an acute milling problem for the Delta Corporation, Hartford, Connecticut. The high speed and precision of a PRECISE Super 60 POWER QUILL easily maintained slot tolerances of .001" on a thin stainless steel jet component without sheet distortion.

PRECISE Super-Speed POWER QUILLS meet every production and toolroom requirement and are quickly mounted with PRECISE mounts on standard and special machine tools. They mill or grind the hardest alloy steel, soft plastic, wood and rubber, aluminum, Masonite and even glass. Their superhigh speeds, high torque, spindle and chuck rigidity permit the use of the hardest cutting tools for faster stock removal, improved surface finishes, maximum tool life, and the maintenance of tolerances to .0001". Adjustable spindle speeds range from 15000 rpm to 45000 rpm with power ratings up to 1½ hp from ordinary 110v or 220v power supplies.

Mail coupon below for complete information on the entire line of PRECISE Super-Speed MICRO TOOLS.

PRECISE PRODUCTS CORPORATION, Racine, Wisconsin, U. S. A.
Branch Plant: Precise, G. m. b. H., Duesseldorf, Germany

Quality and Precision Since 1882

Precise

Power Quills Grinder Millers Milling Machines Accessories
Rotary Cutting Tools Vapor-Lub Cooling Systems

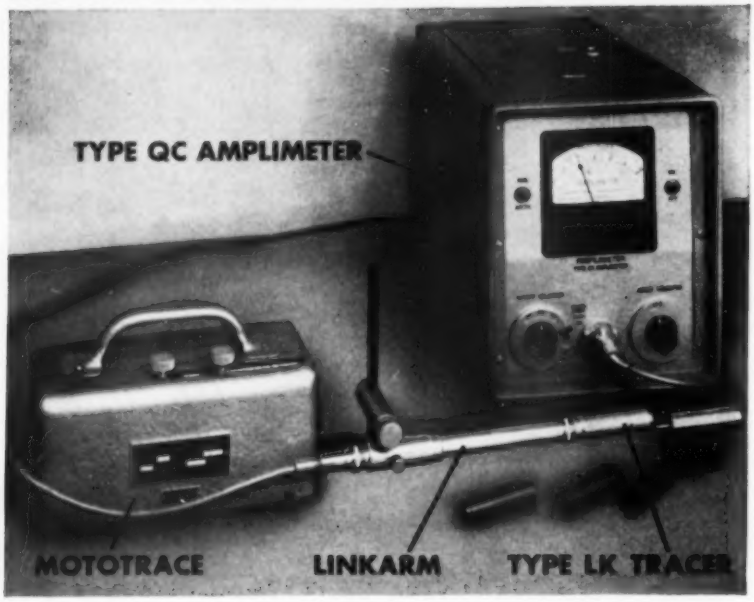
PRECISE PRODUCTS CORPORATION, 3756 Blue River Road, Racine, Wisconsin
☐ Send complete information on Power Tools ☐ Have salesman call.
Also send data on ☐ Cutting Tools ☐ Vapor-Lub Cooling.

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____




CIRCLE 356 READER SERVICE CARD

# NEW! Profilometer® GROUP III




## Measures Roughness of Surfaces from 1/8" to Flat — ID and OD

**THIS shop equipment** handles an exceptionally wide range of roughness measurement—with *proven Profilometer accuracy.* It is lightweight and portable — built for use by shop personnel — and includes the following items:

**NEW Type LK Tracer** — Measures on ID's and OD's as small as 1/8" — flats — tapers — narrow splines — gear teeth. Passes through a 3/4" hole.

**NEW Type QC Amplimeter** — Shows roughness from 0 to 1000 microinches (arithmetical or r.m.s.) on an easy-to-read meter. Has 3 standard roughness width cutoffs. Factory-calibrated for dependability.

**Mototrace and Linkarm** — Give the Tracer a steady support and smooth motion, essential to dependable measurement. No operator skill required.

**FREE LITERATURE** gives details. Write for it. And, without obligation, let us arrange for a demonstration in your plant. We have representatives in principal industrial centers throughout the Free World.

**Remember: You can DEPEND on the PROFILOMETER — first in surface roughness measurement since 1936.**

*Profilometer* is a registered trade-mark

MMC® MICROMETRICAL MANUFACTURING COMPANY

345 S. MAIN ST. ANN ARBOR 1, MICHIGAN


to be used where clearance between parts is very small and must be closely controlled. Type A washers are also listed. Standard for plain washers is jointly sponsored by ASME and SAE.

•

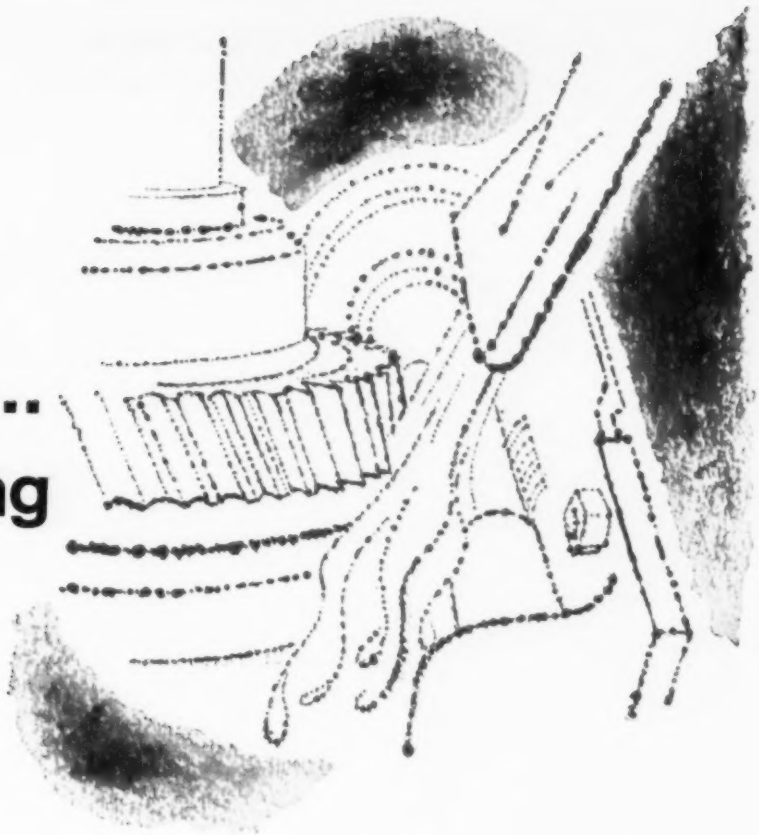
SPECIFICATIONS FOR ELECTRODES — *Available at 50¢ per copy from American Welding Society, 33 W 39th St, New York 18, NY*

*Specification for Low Alloy Steel Covered Arc-Welding Electrodes* — Booklet was prepared jointly by the AWS and the ASTM. Among the more important changes in the specification are: All electrodes now must meet chemical requirements as well as mechanical properties if they are to be listed in an AWS-ASTM electrode classification; a new classification has been added which covers electrodes giving a minimum strength of deposited metal in stress relieved condition of 110,000 psi; new classification will be known as the E110 Series. New electrodes have been added to Table II, Chemical Requirements, in order to meet the demand for standard electrodes to deposit weld metal having specific properties.

*Specification for Mild Steel Arc Welding Electrodes*—Booklet covers changes in the specification including: three new iron powder electrodes, two of which are low hydrogen electrodes; new E70 mild steel classification containing six electrode types; certain electrodes can be listed now in the E70 Series as well as the E60 Series; new requirement has been added—chemical requirements must be met with certain electrodes to insure the deposition of mild steel weld metal. Two very useful tables added to the appendix: one shows mechanical properties to

*"He worked overtime so we could afford this!"*

# Hobbing... Cutting Oils... and Reducing Rejects



Fewer rejects mean lower unit cost. For extremely tough jobs, Sinclair Ordnance heavy-duty type cutting oils have earned the reputation—in plant after plant—for increasing production by reducing rejects. Ordnance Oils assure excellent finish, cooler parts and extended tool life. Next time you have a threading, broaching, hobbing or other difficult metal-working operation, show management how you saved money and further reduced rejects with Sinclair Ordnance Cutting Oils.

**Call your Sinclair Representative** for further information, or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. There's no obligation.

**Sinclair**
*Ordnance Cutting Oils*

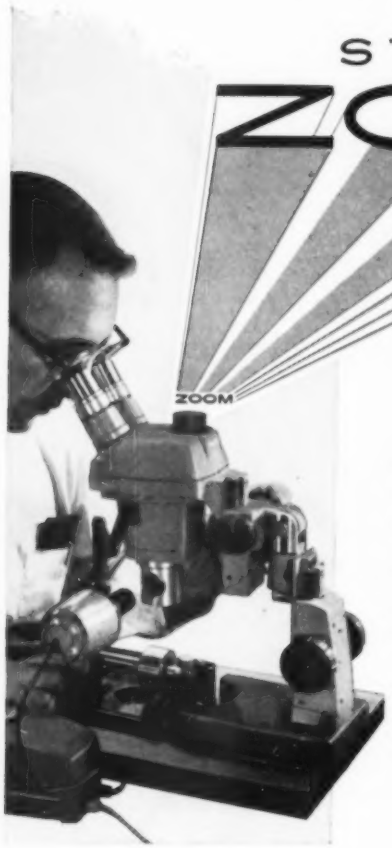


CIRCLE 358 READER SERVICE CARD

# NEW! BAUSCH & LOMB STEREOMICROSCOPES

*give you*

STEREO ZOOM




CONTINUOUSLY VARIABLE POWER

Here's a completely new optical concept to speed and simplify work requiring 3D views. Just turn the magnification knob and watch the brilliant stereo image zoom to the *exact* size you need. Not just a few fixed powers, but *any* power within the wide stereo range. The newest step forward to faster, easier 3D work . . . and it's exclusive with Bausch & Lomb.

**Featuring Exclusive POWER POD Design Concept**

- Sealed to prevent dust and foreign matter from entering optical system!
- No nosepiece!
- No individual objectives . . . no objectives to change!
- No image jump!
- No image blackout!

**Featuring NEW LOW PRICE**
. . . about one-third lower than previous line!

**MAIL COUPON NOW!**

BAUSCH & LOMB

America's only complete optical source . . . from glass to finished product

BAUSCH & LOMB OPTICAL CO.
61841 St. Paul Street, Rochester 2, N. Y.

- ☐ Send me new B&L Stereomicroscope Catalog D-15.
- ☐ Schedule a demonstration at my convenience.
- ☐ I'd like to borrow a B&L Stereomicroscope for 15-day trial without cost or obligation.

Name, Title .....
Company .....
Address .....
City ..... Zone ..... State .....


be expected in the as-welded condition, the other gives a comparison of current ranges.

•

NEW WELDING SYMBOLS—*Booklet, 87 pages, ($3), and charts (wall chart, $1.50, smaller replica, 50¢) available from American Welding Society, 38 W 39th St, New York 18, NY*

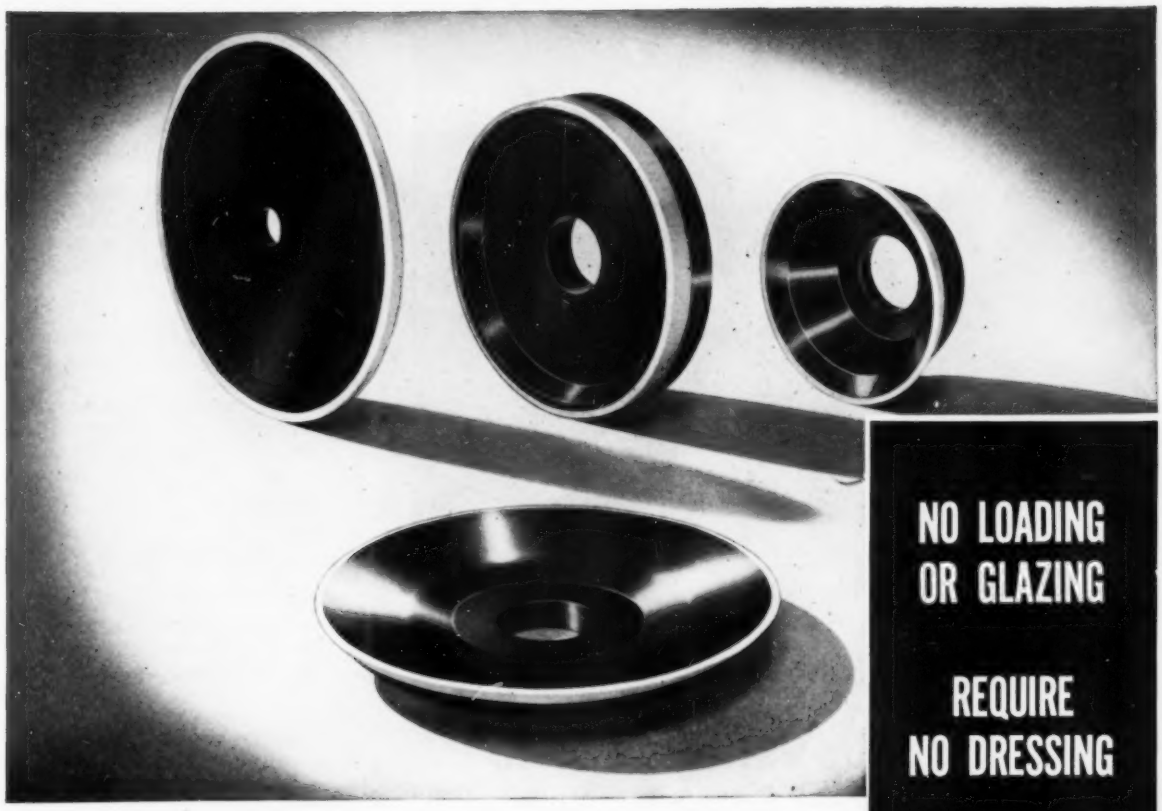
First major change in welding symbols in recent years, new standard AWS A2.0-58 contains many additions and improvements. Among the new symbols are: symbols for spot and seam welds made by arc welding; symbols for welds used in aircraft, guided missile and automotive work; and symbols for the types of welds used in structural steel fabrication, and reinforced concrete work. Table is included which provides a new system for designating welding and cutting processes by means of letters. System covers the 37 commercially used welding processes and also provides a means for indicating automatic welding, machine welding, manual welding, and semi-automatic welding.

•

DIAMOND DRESSING TOOLS—*Available from American Standards Association, 70 E 45th St, New York 17, NY, Price $1*

ASA B67.1 sponsored by the ASTE and the Industrial Diamond Association of America, establishes standard shank dimensions of diamond tools used for dressing or truing grinding wheels. Tools listed in the standard are expected to apply to off-hand wheel dressing operations as well as to automatic wheel dressing attachments for machine tools, including fixtures that mechanically turn the

*"Not only do we offer a retirement plan but in this factory you'll age more rapidly."*



NO LOADING OR GLAZING

REQUIRE NO DRESSING

BONDED FOR SPECIFIC GRINDING REQUIREMENTS

NATURAL OR MAN-MADE DIAMONDS

# MANHATTAN DIAMOND WHEELS

## *CUT FASTER, COOLER . . . LONGER*

Every Manhattan Diamond Wheel is specially *bonded* to assure precision grinding at top speed without loading or glazing. Resinoid bonded for tungsten carbide grinding, they cut cool and free with lightest pressure . . . eliminate danger or damage to heat-sensitive carbide. Special metal bonds give you the finish you want for glass, quartz and ceramics. They require no dressing — for either wet or dry grinding.

Manhattan Diamond Wheels give you faster, cooler cutting action *plus* higher wheel efficiency and longer life on the toughest jobs. Specify from Manhattan's wide variety of surface-contact shapes . . . in the diamond concentration and grit size best suited for your surface, cylindrical, or internal grinding operations. You get "More Use per Dollar" with Manhattan Diamond Wheels.

RM 947

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO DIAMOND WHEEL DEPARTMENT

**MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY**

**RAYBESTOS-MANHATTAN, INC.**

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

## Four "Bonus Values" Add to the Safety of Acco X-Weld Sling Chains!

• For certain types of lifts, there is one and only one product to use for maximum safety and efficiency...chain! But why only chain? Because chain offers qualities of tensile strength and flexibility not found in any other material. The next time you are confronted with an extra-heavy lifting problem, don't take a chance with a makeshift sling *that may not do the job!* Be sure...with ACCO *Registered* Sling Chains! Only with ACCO *Registered* Sling Chains do you get these four "bonus values" which add materially to the worth, but not the cost, of the sling...

1. **Accoloy X-Weld Chain** for extra strength. X-weld hangs straight... cannot kink...has extra resistance to bending
2. **New Shaped Master Link** is designed to withstand deformation under loads up to 18% greater than round section link
3. **Acco Registration Ring** is serially numbered as evidence that the sling has been proof-tested at twice its working load limit
4. **Registration Certificate** signed by American Chain & Cable Company attests to the field-design of the complete sling

Only ACCO *Registered* Sling Chains, with Magnafluxed-tested hooks, give you premium quality features at regular prices. Find out about them from your nearby ACCO *Registered* Sling Chain Distributor or write us at York, Pa., for full details.

ACCO Registered
**CHAIN SLINGS**

American Chain Division · American Chain & Cable Company, Inc.
Bridgeport, Conn. • Factories: *York and *Braddock, Pa.
Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco
*Indicates Warehouse Stocks

ACCO

diamond tool during its work cycle. Included in the standard are a designation system, nomenclature, and dimensions and tolerances for straight shank tools and headed shank tools.

•

MECHANICAL WORLD YEAR BOOK 1959 EDITION. *Published by Emmott & Co Ltd, 31 King St W, Manchester 3, England. 492 p, 4 x 6. Price 5/2 ($0.75).*

A handy source of reference in the mechanical engineering field, this new edition contains a new article on the subject of cold-formed design and gives complete data on the subject. In addition to scores of useful tables and formulas, the book also contains a buyers' guide in English, French, and Spanish.

•

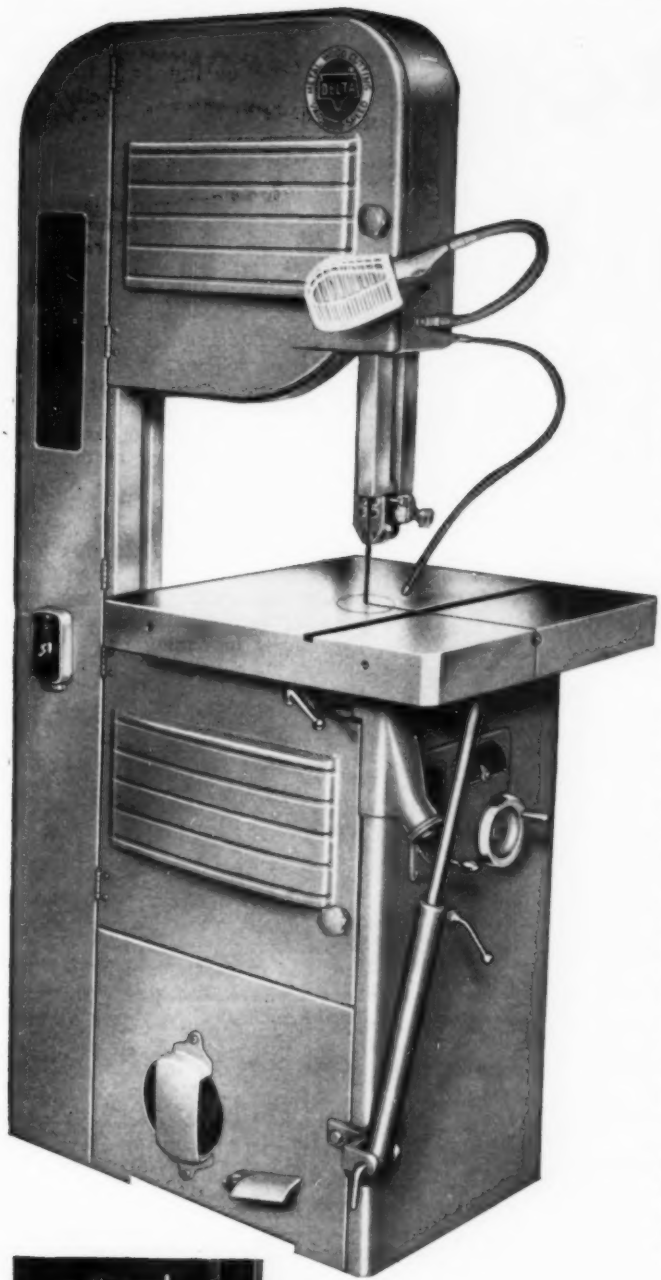
THE BOOK OF THE LATHE, *by C T Bower. Published by MacMillan Co, 60 Fifth Ave, New York, NY. 192 pages, 5¼ x 8¼. Price $3.50.*

Although written around the small, light-duty engine lathe, this book is filled with ingenious ideas on gadgets, special tools, labor-saving tricks, and short cuts that can be applied equally well to heavier equipment. The opening section deals with the general features and operation of the lathe, and should be of interest to apprentice and home craftsman. The remaining two-thirds are devoted to the various turning processes and include the author's ideas on how some of the traditional processes may be improved. Even professional operators may study this portion with real benefit to their productivity capacity.

Some readers may experience a

*"You're scheduled to bump Grogan here."*

# NEW from DELTA



## 20" metal-wood *variable speed* BAND SAW

No matter what your cutting requirements —in the foundry, toolroom or pattern shop —this all-new Delta 20" Metal-Wood Band Saw gives you real on-the-job performance. Now—*for less than $900.00*—you can have the features you said you wanted most for greater accuracy and better cutting:

**WIDE RANGE VARIABLE SPEED DRIVE**··· gives you a tremendous speed range—50 to 4500 FPM—for cutting everything from stainless steel to aluminum, wood and plastics. This versatility can't be equalled.

**SCIENTIFICALLY DESIGNED BLADE GUIDES**··· ideal for heavy metal cutting because they furnish more "close up" blade support than conventional type guides. These new Delta blade guides are the key to better accuracy, straighter cuts, and longer blade life.

**RUGGED FRAME CONSTRUCTION**... features a massive, rigid internal frame with a modern fabricated exterior. Exclusive 3-point adjustability (wheels, upper guide and table) assures perfect alignment of key components.

In addition to these outstanding features you get a massive table with double trunnion support, convenient speed controls, plus built in chip blower *at no extra cost.*

**SEE IT AT YOUR NEAREST DELTA DEALER**—he's listed under "TOOLS" in the Yellow Pages—or write: Rockwell Manufacturing Company, Delta Power Tool Division, 618E N. Lexington Avenue, Pittsburgh 8, Pa.

**BLADE WELDER,** including shear and grinder, shown on No. 28-462. Bracket mounted on 20" Band Saw for machine-side use. (Optional accessories)

DELTA INDUSTRIAL TOOLS

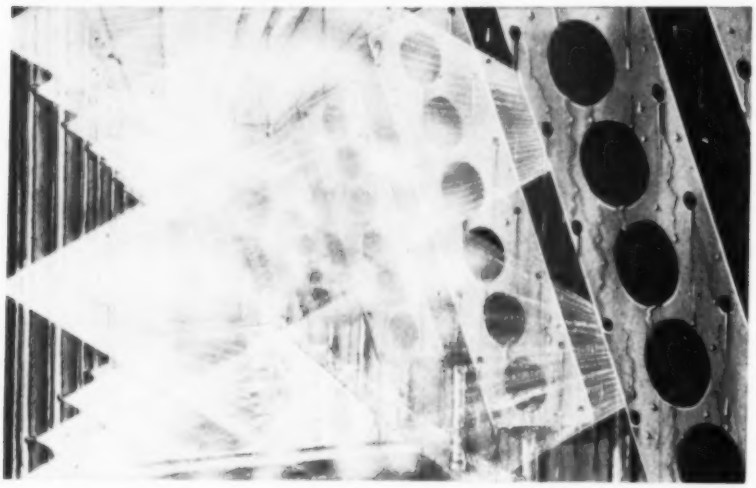
another fine product by

ROCKWELL

*To get more from your spray washer*

# ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS



## New Oakite 198 sprays off soils fast . . . protects in-process parts from rust

Users tell us that nothing equals Oakite 198 for cleaning parts in-process. Here's why they think so:

- *It clears off heaviest soils at temperatures up to 180°F, and light soils at room temperature.*
- *Metal chips wash away under its action.*
- *When dry it leaves a protective film that prevents the rusting of machined or ground parts prior to assembly—yet it doesn't affect accurate gauging.*

Now largely used in automotive plants, Oakite 198 is proving its economy as well as its unique effectiveness in providing fast, smut-free cleaning plus rust protection. It works in single or multistage machines, at economical concentrations.

Oakite 198 is just one of a complete line of Oakite materials for machine cleaning. There are non-foaming solvent agents for heaviest duty cleaning, alkaline cleaners for removing moderate to light soils. When you ask Oakite you can be sure of getting a cleaning compound designed to give you best possible results, designed to reduce your "per unit" cost. You can be sure, too, of getting prompt, intelligent in-plant service from your local Oakite man.

Send for Bulletin. Oakite Products, Inc., 24 Rector Street, New York 6, N. Y.

*it PAYS to ask Oakite*

OAKITE

50 1909-1959 SCIENCE

*years' leadership in industrial cleaning*

little difficulty with British spelling and terminology, but this is readily overcome by the aid of the 150 illustrations. The line drawings are exceptionally clear, as they have been made to illustrate specific points and are uncluttered with extraneous material. The photographs, taken specially for the job, are of unusual clarity and quality and, like the drawings, emphasize exactly the the point under discussion.

•

QUENCHING OF STEELS—*Published by the American Society for Metals, 7301 Euclid Ave, Cleveland 3, Ohio. 77 pages. Size 8½ x 11 in. Price, $2.95.*

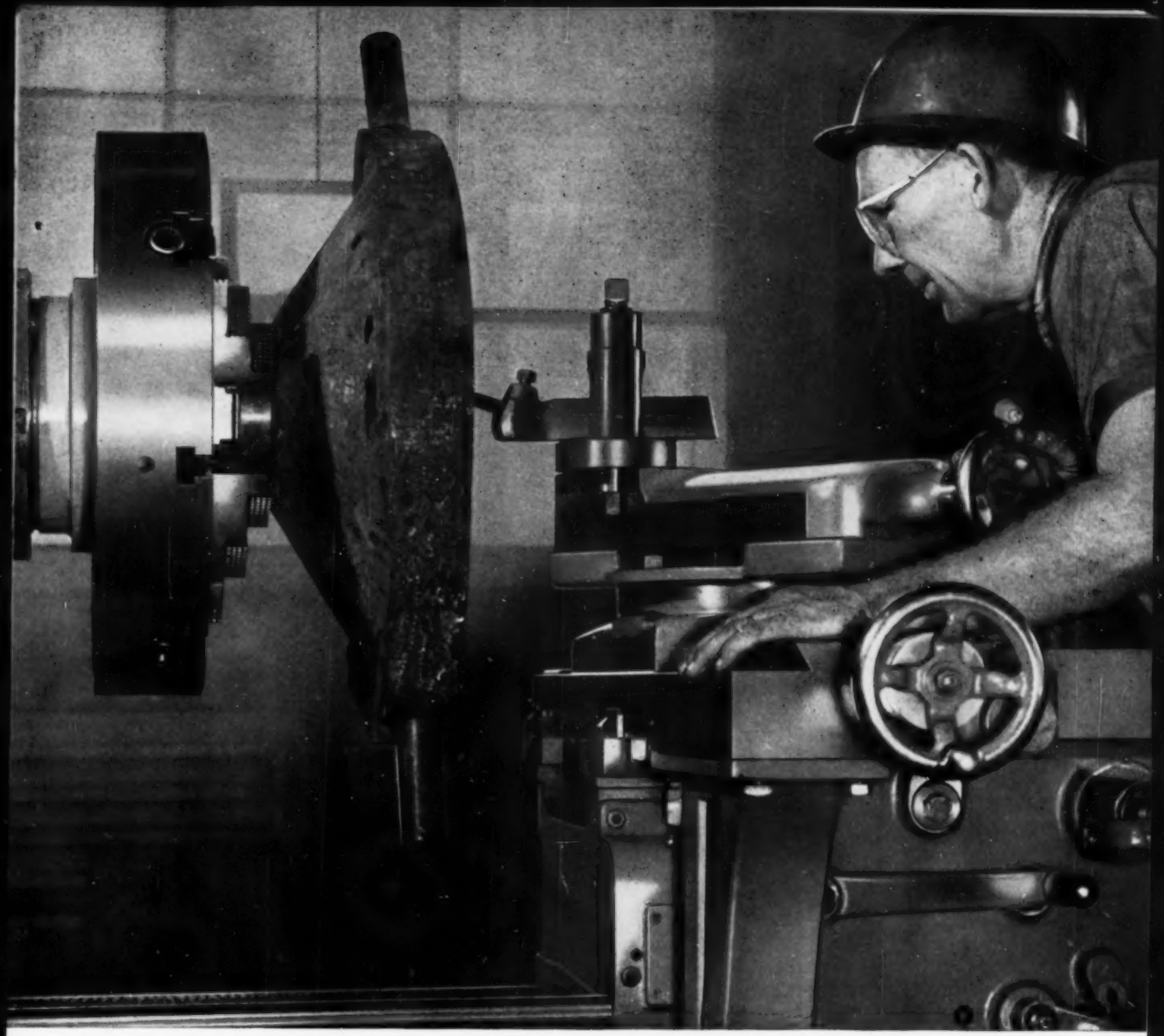
Covering the subject of quenching from basic cooling rate discussions to a description of automatic quenching techniques and equipment, this book is a compilation of six papers presented last October at the 40th National Metal Congress.

Cooling rate, a major factor in hardening, is examined in two of the papers. Though presented from different viewpoints, both papers emphasize that cooling rates vary with the temperature of the surface. How this affects hardening and hardenability, and the limitations it introduces are discussed.

Quenching media come in for discussion in three papers. One outlines the tests and test equipment used in the evaluation of hardening power and cooling power of various media. The other papers cover hot oil quenching and the selection of quenching media.

The final paper, on automatic quenching of steels, reviews the advances in the mechanization and automation of heat treating lines. All six papers are illustrated, with charts and/or photos.

*"Take it easy, man! You've got a whole minute before the whistle blows!"*



*Operator machines $1200 oblique-shaped, 31" diameter cross-head plate on Nebel extension bed gap lathe in half the usual time.*

# Odd shapes to 40" dia. machined to .0004" in ½ time on NEBEL extension bed gap lathe

The Port Arthur, Texas plant of Koppers Co., Inc., works with flammable gas under high pressures. Equipment maintenance demands perfect machining, with accuracy to four ten thousandths inches. The firm installed a Nebel extension bed gap lathe to obtain this precision, plus the extreme versatility necessary to swing large, odd-shaped parts.

The 28"/50" Nebel, with its 120" centers, 52" swing through the gap, and load-carrying capacity of over 37,000 pounds, satisfies Koppers' need for a "universal" unit. It has eliminated "shut-down time" in production, machining overnight pieces that previously required weeks of delay for replacement, being impossible to chuck or face on an ordinary lathe. Often, the machine "doubles" as an engine lathe.

Set up and geared for metric threading, ranging from 1.75 to 80 threads per mm., offering a precision impossible and impractical with competitive machines, the Nebel cuts machining time in half on most jobs, including the numerous special alloys used by Koppers.

*Learn how the incomparable accuracy and flexibility of a Nebel extension bed gap lathe can save you time, money and space. Write for free detailed bulletins on the complete line today!*

**NEBEL LATHES**

CIRCLE 364 READER SERVICE CARD

Nebel Machine Tool Corporation
3407 Central Parkway, Cincinnati 25, Ohio

# INTRICATE SHAPES, PRECISELY FORMED IN 2 TO 10 MILLISECONDS

*By DYNAPAK, a breakthrough in high-energy-rate metal working equipment*

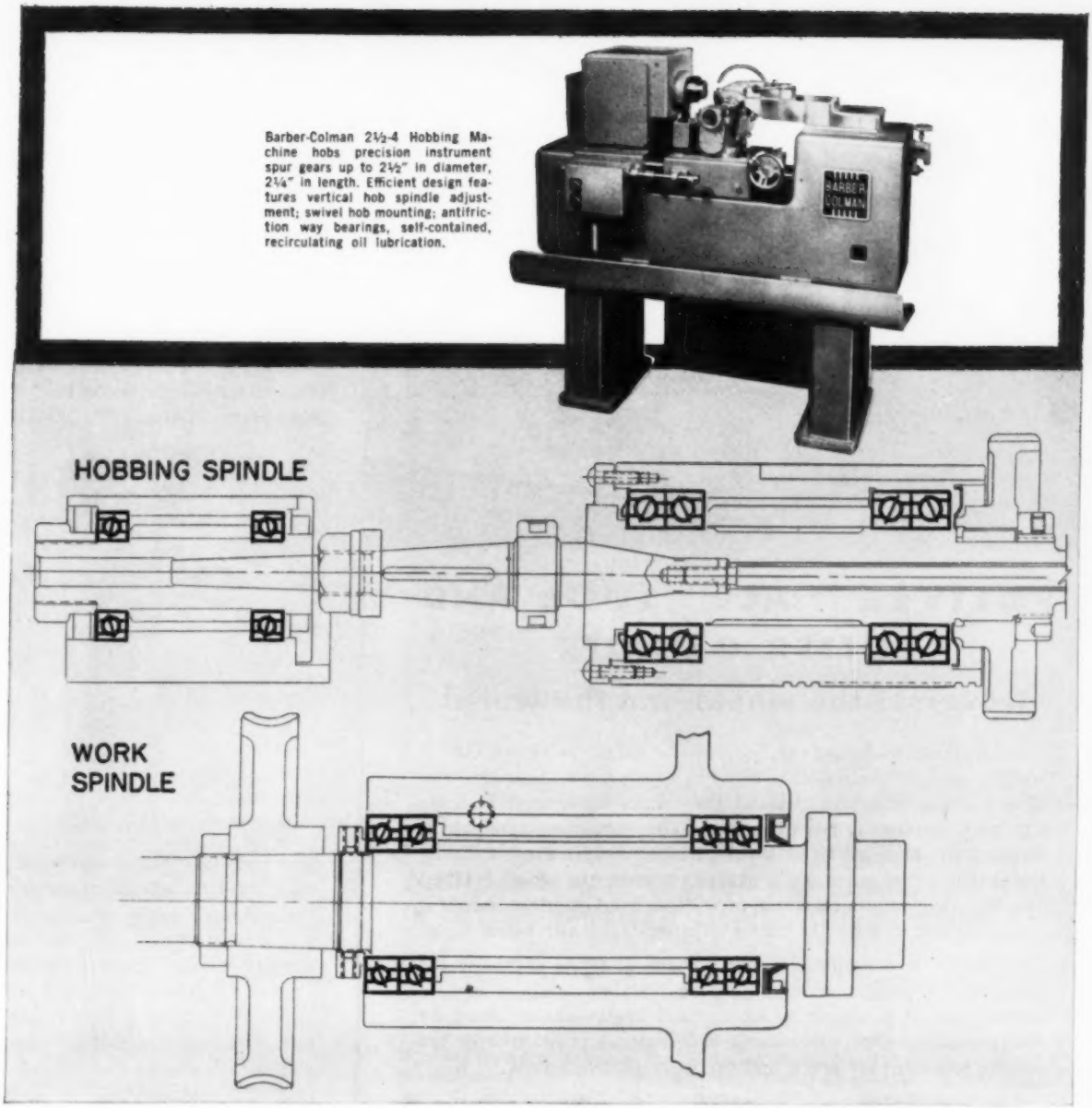
Pneumatically energized DYNAPAK, industry's first high-energy-rate machine tool, has produced the shapes pictured here, and many others of equal intricacy. DYNAPAK is equally applicable to extrusion, forging, forming, or compaction. DYNAPAK offers energy outputs from 40,000 to 1,500,000 foot-pounds – tool speeds to 2500 inches per second, controllable to ±12 inches per second. Elapsed time from billet to finished piece, 2 to 10 milliseconds, is so brief as to minimize heat transfer to the die – permits working metal at temperatures to 3500°F – yields longer die life.

***DYNAPAK requires no separate pneumatic power source... DYNAPAK is easily installed, horizontally or vertically... DYNAPAK produces smooth surface finishes, radii to .003", webs to .010", fins to .010"; forges to near-zero draft angle. Evaluate DYNAPAK for your metal working problems. Write, wire or phone.***

**DYNAPAK**

**CONVAIR, A DIVISION OF GENERAL DYNAMICS CORPORATION**

1243 Transit Avenue, Pomona, California · Phone NAtional 9-1109


Barber-Colman 2½-4 Hobbing Machine hobs precision instrument spur gears up to 2½" in diameter, 2¼" in length. Efficient design features vertical hob spindle adjustment; swivel hob mounting; antifriction way bearings, self-contained, recirculating oil lubrication.
BARBER COLMAN
HOBBING SPINDLE
WORK SPINDLE

# Relative rotation of hobbing machine spindles held accurate within 20 seconds using Fafnir Ball Bearings

## New Barber-Colman 2½-4 machine precision-hobs spur gears for instruments

If two words can sum up the design of Barber-Colman's new 2½-4 Hobbing Machine, they are *accuracy* and *rigidity*.

Developed for hobbing AGMA Precision Class 3 fine-pitch spur gears for guidance systems, the 2½-4 has a minimum number of parts at points where deflection or inaccuracies might occur.

In selecting bearings which would complement the accuracy of the gears in the machine, Barber-Colman designers got the performance they wanted with Fafnir super-precision ball bearings. Single row, extra-light, counter-bore types, eight used in duplex pairs, help maintain indexing accuracy within *20 seconds*.

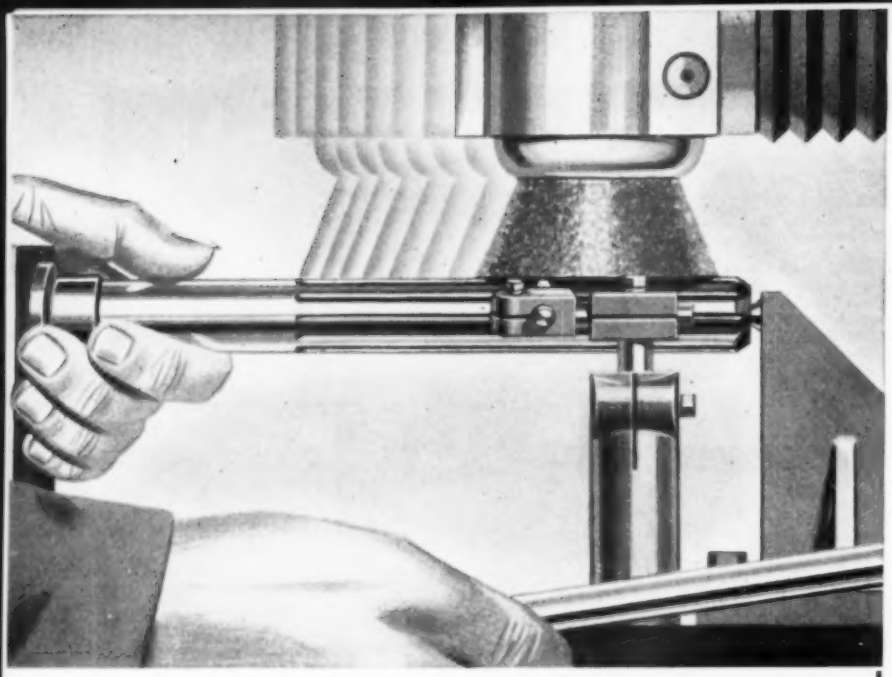
The application is typical of thousands Fafnir has handled where performance requirements put an extra premium on bearing selection. Chances are, Fafnir experience — plus breadth of line — can answer bearing problems you may have. Write The Fafnir Bearing Company, New Britain, Connecticut.

**FAFNIR**
**BALL BEARINGS**

10 Fafnir Extra-Light Super-Precision Ball Bearings, snug fit, support the Barber-Colman 2½-4 machine spindles. 4 variations, equipped with composition retainers, are available in this one series to meet specific load and speed requirements where exceptional rigidity is wanted.



CIRCLE 366 READER SERVICE CARD



## OLIVER "ACE" TOOL AND CUTTER GRINDER

### Traverses the wheel—not the work!

You can grind tools and cutters more accurately with the Oliver "ACE" because the wheel is brought to the work, reversing the usual process. Abrasive dirt and grit cannot cause wear because the cross carriage is not in motion. The horizontal ram which supports the grinding head is fully enclosed—sealed against dust and dirt. Further accuracy is assured because the wheel is trued by a stationary diamond which provides a fixed grinding line. It is not necessary to reset the cutter to compensate for wheel wear.

The "ACE" is a tool and cutter grinder designed expressly for tool grinding—not a general purpose machine adapted to tool room work. It is simple to set up. All angles are obtained by direct reading. Operators stand in a natural position with the control lever in easy reach and the work in direct view.

Face mills, reamers, end mills, staggered tooth cutters, slab mills, spot facers—all cutters straight or spiral—are quickly, easily and economically sharpened with the Oliver "ACE". Both standard and heavy duty models are extensively used for sharpening carbide-tipped circular wood saws used in both woodworking and metalworking.

Write today for complete information. We'd appreciate the opportunity of sending a quotation.

## OLIVER of ADRIAN

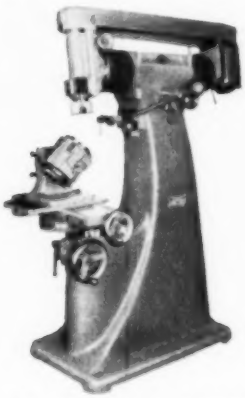
1414 E. Maumee St. • Adrian, Michigan

DRILL GRINDERS AND THINNERS—TOOL AND CUTTER GRINDERS—AUTOMATIC AND MANUAL FACE MILL GRINDERS—TOOL BIT GRINDERS—CONTOUR SAWING AND FILING MACHINES

*(Advertisement)*

## HOW TO REDUCE YOUR CUTTING TOOL COSTS

Three elements are absolutely necessary if there is to be a substantial reduction in cutting tool costs—the right tool, the right geometry of grind on that tool, and the right machine to produce the grind. There are various machines which will always be most suitable for specific applications. However, for the average cutter grinder jobs, Oliver has pioneered a new approach to the problem with the introduction of the "ACE" tool and cutter grinder.



*The Heavy Duty "ACE"*

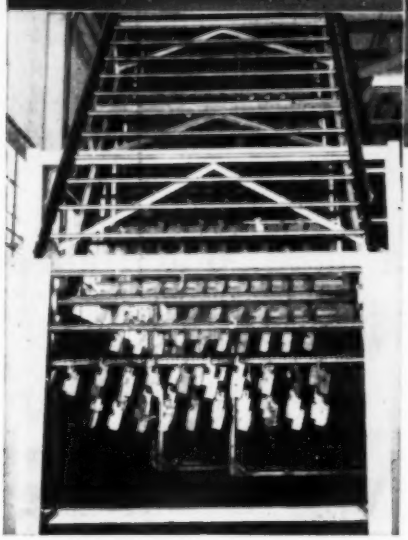
The cost savings are attractive with respect to both setup time and grinding time. Setup usually consists of two simple "direct-reading" adjustments. The first setting is made to produce the angular or straight line grind requirement. The second setting consists of tilting the grinding wheel spindle to produce the proper clearance—all extremely simple.

Grinding time is reduced considerably because tool travel is eliminated in most cases. Thus the time consists wholly of bringing the grinding wheel on and off the cutting tool. This compares extremely favorably with competitive grinding procedures.

This combination of easy setup and rapid grinding is found only on the economically priced Oliver "ACE" tool and cutter grinder.

There are two versions of the "ACE": the standard, which is suitable for high speed and light duty carbide grinding, and the heavy duty model which is designed for grinding tungsten carbide cutters and tools in all of their many forms.

# FINISHING SYSTEMS...



The 8 Ft. wide Crossbar Conveyor carries a variety of products and a great mass of small parts through all processing units of the Dip Coating System. The Crossbars in the Conveyor are designed for a work load of 250 lbs.

## Complete Mahon Installation Provides Compact Facilities for DIP COATING and SPRAY PAINTING in CUTLER-HAMMER'S Lincoln, Illinois Plant!

In this unique finishing system, the greater part of which is located on the roof, Mahon engineers have employed what is probably the longest continuous crossbar conveyor ever designed into equipment of this type.

The painting enclosure shown above is inside the large electrical plant. This enclosure is divided into two sections, one of which has a paint mixing room on the ground floor and paint Dip Tanks on a mezzanine floor above. The other section houses two Spray Booths and a Batch-Type Finish Baking Oven. The conveyorized, Five-Stage Metal Cleaning and Rust Proofing Machine, Dry-Off Oven, Finish Baking Oven and the Filtered Air Supply Equipment are housed in one enclosure on the roof.

This is the third complete finishing system installed by Mahon in Cutler-Hammer Plants across the country.

If you have a finishing problem, or are contemplating new finishing equipment, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering which is so important in specially designed equipment of this type.

*See Sweet's Plant Engineering File for Information, or Write for Catalogue A-659*

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

# MAHON

◀ CIRCLE 367 READER SERVICE CARD

CIRCLE 368 READER SERVICE CARD

# WHERE DO YOU LOOK FOR LOWER COSTS?

## to longer life from a tool costing 4¢ an hour or to greater output from a machine that costs $8 an hour

**THIS COMPARISON TELLS THE STORY**
(This is only one of many examples . . . details of others on request)

| | 240 minute tool life setup TOOL COST: 4¢/hr. | 25 minute tool life setup TOOL COST: 40¢/hr. |
|---|---|---|
| Machine cost per hour | $ 8.00 | $ 8.00 |
| Tool cost per hour | $ .04 | $ .40 |
| Cost per 8-hour shift | $64.32 | $67.20 |
| Pieces run per shift | 51 | 181 |
| COST PER PIECE | $ 1.26 | $ .37 |

## Here's how some shops have doubled...tripled...quadrupled the output of expensive machines

From many machine shops the story is the same—*they sacrificed low-cost carbide inserts through increased feeds and speeds . . . and achieved startling savings in total-cost-per-piece.* Production increases even greater than 100% have been recorded. The increased tool costs were insignificant by comparison.

Where machines have been operating at less than maximum efficiency, *unit cost can be reduced overnight* . . . merely by using modern cutting tools to get full potential machine output . . . instead of operating at fractional machine capacity to gain long tool life.

This idea has been PROVEN-IN-USE by many progressive plants. We will gladly send you records of such operations. These results can be duplicated in plants where machines and talented operators have been held back by old ideas about tooling and tooling costs. Ask your Kennametal Carbide Engineer how Kendex* (patented) tooling can help get more efficient output from *your* machines . . . or write KENNAMETAL INC., Latrobe, Pennsylvania, for additional information.

*Trademark

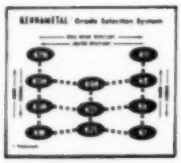
5791

INDUSTRY AND
**KENNAMETAL**
*. . . Partners in Progress*

**TO MULTIPLY YOUR MACHINE OUTPUT ...YOU NEED 3 THINGS:**

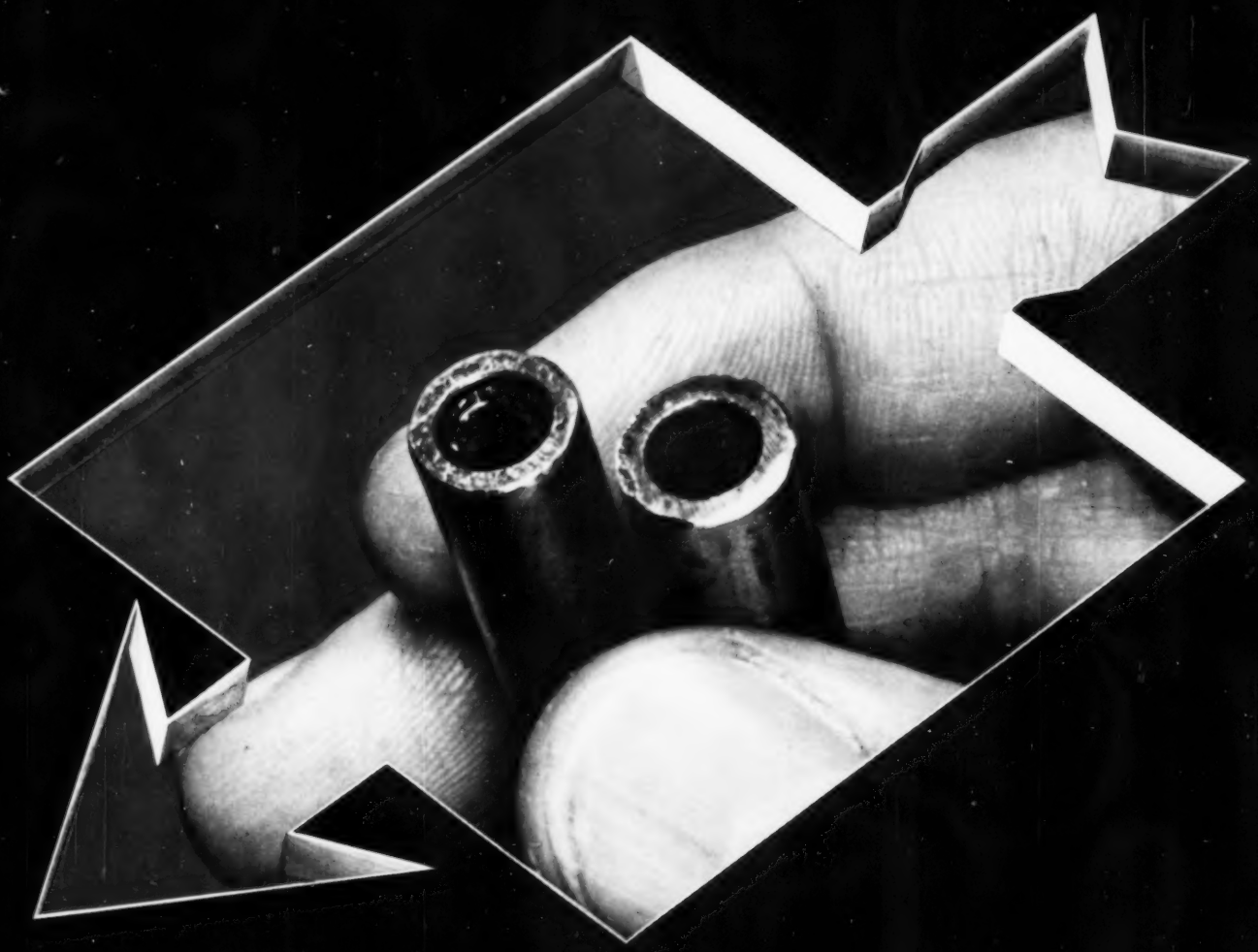
**The 'Three-Man Tooling Team'** that utilizes the specialized knowledge of your Tool Engineer, your Machine Operator, and the Kennametal Carbide Engineer . . . *to get the right tooling on every job.*

**The Kennametal complete range of grades** that provides the precise properties and uniformity that permits *accurate prediction of tool life.*



**Kendex Instant insert change** without need to reposition the tool. This is the key to this new practice . . . *frequent tool change without excessive down-time.*

Quality–the best economy of all



## Two oils...two lines...one clogged...one cleaned

A Sunvis 700 oil and a regular oil were run through two equally clogged hydraulic lines. The regular oil couldn't remove the sludge. The Sunvis 700 oil cleaned its line thoroughly. That's one job it's made for . . . to clean out sludge deposits in hydraulic lines while it transmits power.

With a Sunvis 700 oil—like every Sunoco oil—you enjoy the best economy of all: the economy of quality. A Sunvis 700 oil lasts longer. The machinery it protects lasts longer. It prevents rust . . . ups output by reducing downtime.

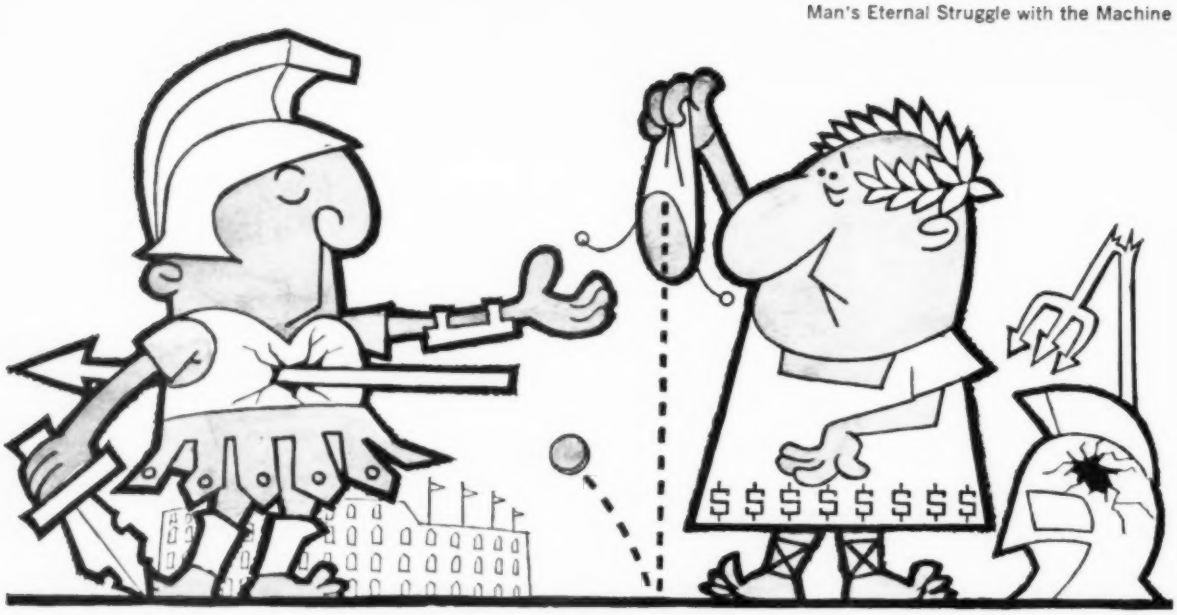
**FREE Trouble-Shooting Chart** will help you spot and cure common hydraulic system troubles. For your copy, write to:

**Sun Oil Company, Philadelphia 3, Pa., Department I-12.**

**MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES**

SUNOCO®

Man's Eternal Struggle with the Machine




WITH ALL THE COSTS OF DOING BUSINESS RISING STEADILY, PROFIT IS MORE ELUSIVE THAN EVER!

# How long can the cost of "getting new equipment to work right" be buried in overhead?

No matter how attractive the original price of the equipment, it's false economy if the price tag *did not* itemize the extra money required to get it into production!

To your great responsibility for improving manufacturing processes has been added an *extra* concern for that old standby, catch-all type goodfellow called "overhead".

Overhead can no longer afford the labor and hard, cold cash-money often needed to make new equipment operate properly.

Sciaky knows about "overhead", too. That's why Sciaky resistance welding and production equipment is built to satisfy the requirements of *your* particular application. That's why Sciaky equipment is thoroughly tested and proved to do that particular job *before shipment.*

The result protects the profit your manufacturing operations can earn by (1) providing only the right equipment at the right price, (2) minimizing the lost time and cost of production try-out, and (3) minimizing rejects and costly re-working.

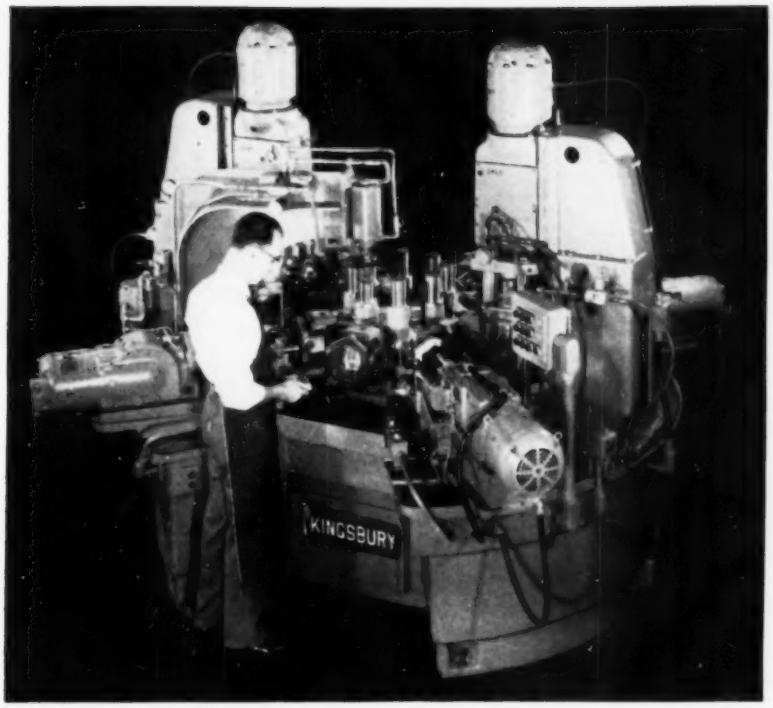
Why take less than the full advantage of consulting with a Sciaky Application Engineer the next time you are considering equipment. No obligation, of course.

A successful manufacturer of double-bowl kitchen sinks took that advantage. As a result, they replaced the previous high-reject, unprofitable method of fabrication with Sciaky resistance welding equipment. Within only ten days of installation, over 10,000 sink units were produced with less than a 1% scrap factor. Write for "Resistance Welding At Work", Volume 4-No. 6 for the details.

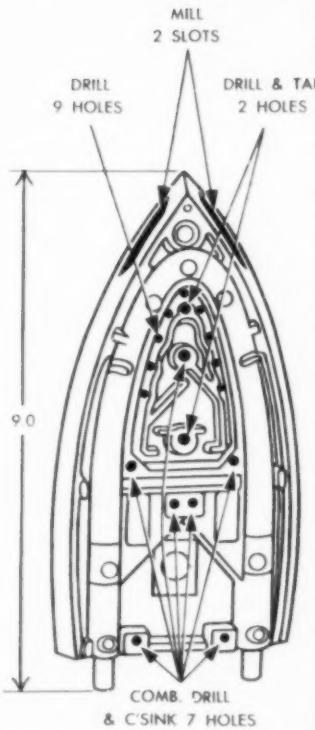
SCIAKY

SCIAKY BROS., INC., 4933 W. 67th STREET, CHICAGO 38, ILLINOIS • POrtsmouth 7-5600

*(Advertisement)*




# 22-spindle Kingsbury mills 2 slots, drills 18 holes, taps




*DIE CAST ALUMINUM FLAT IRON SOLE PLATE*

Five horizontal and two vertical units operate 22 tools. The vertical units mill the slots with six-inch cutters. Each cutter rotates so the thrust is down. The slots, incidentally, make it easier to iron around buttons.

Four horizontal units drill 11 holes and combination drill and countersink 7 holes. Bushings guide these tools. The last unit taps two of the holes.

A 30-inch index table holds eight work fixtures. Each has power clamping and automatic unclamping through use of an air cylinder. The point of the work is up, and clamping is outward against a fixed front plate. Gross production is 520 parts per hour.

Production men praise our machines. "Can't remember when we had trouble with them."

"Our Kingsburys do a nice job for us."

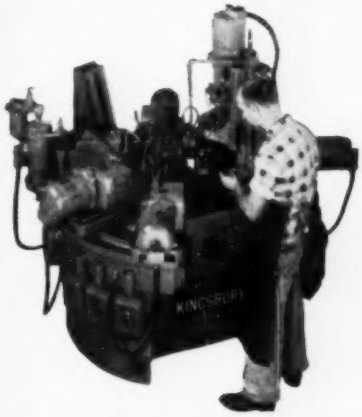
"Hardly ever get a bad part."

We think we earn those compliments. Forty years behind us and we still work hard on every machine we build. Good basic design, rugged construction, test runs before shipment — all that sort of thing really pays off.

For high production at low unit cost, ask to have a representative call and talk over your jobs. Let him get you a specific proposal. If we say we can do it, we can do it. Kingsbury Machine Tool Corp., Keene, N. H.

**KINGSBURY** MULTI-UNIT AUTOMATICS

## Secondary operations on screw machine parts




This 7-spindle Kingsbury operates on three parts for electric typewriters. It drills, chamfers, taps and burr reams 430 parts per hour (gross).

A 12-inch index table holds eight work fixtures with automatic clamping, unclamping and ejection. Different jaws and work locators are used for the three parts.

Part **A** uses all seven units. Six horizontal units operate on two cross holes 90° apart. A vertical unit burr reams the center hole. Parts **B** and **C** each use only three units.

## Typical Kingsbury jobs in eight industries

These parts are used in a food mixer, water meter, automatic transmission, dial telephone, plumbing, air conditioner, rifle, and typewriter. All cost less on Kingsburys.



CIRCLE 372 READER SERVICE CARD 

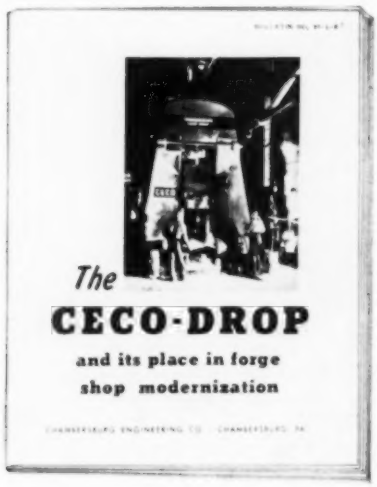
# The CECO-DROP makes other gravity drop hammers obsolete

**THIS is no mere slogan; it is a statement of fact.** Since its introduction twelve years ago, the Ceco-Drop, in installation after installation, has proved its greater productive capacity and its economy over any other gravity drop hammer.

These are not unsupported claims. They are backed up by testimonials from users: like **"increased production over board drop between 10-20%"**; "die life on the Ceco-Drop is nearly double"; **"the first two Ceco-Drops have saved approx. $3000 each** in maintenance and boards in first year"; "after approx. 1200 production hours, one Ceco-Drop had total of less than 10 hours maintenance"; **"I would give a good deal if I had all of our board hammers out of the shop and nothing but Ceco-Drops"**; and hundreds of others.

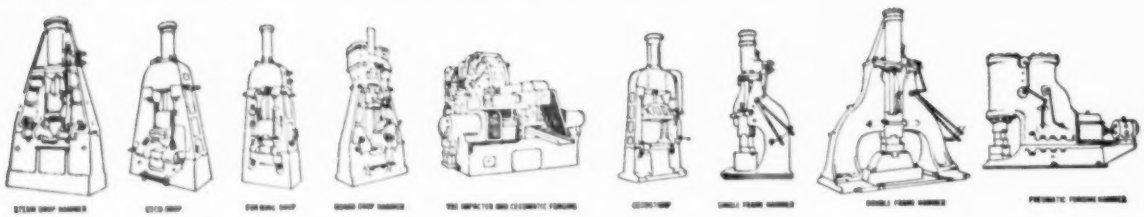
To convince yourself, you should read Chambersburg's 28-page bulletin on Forge Shop Modernization.

Send for your copy today.




CHAMBERSBURG ENGINEERING COMPANY . . . . . CHAMBERSBURG, PENNSYLVANIA

## CHAMBERSBURG • The Hammer Builders



# automation at its best!! as *only BAUSH can do it* - -

with Baush *completely mechanical* transfer machines using "S"-Type Leadscrew Units . . .

## TO GIVE YOU:

Easy, economical maintenance with shop mechanics . .
Interchangeability of units . .
No expensive hydraulic oil . .
No costly hydraulic leaks . .
Positive, steady tool feed . .
No surge or tool breakage in break-thru . .
Longer life of motors, gears, spindles and guide bushings . .

WHY NOT TRY US?

B
BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

CIRCLE 374 READER SERVICE CARD

# Questions and Answers about ELCIDE 75

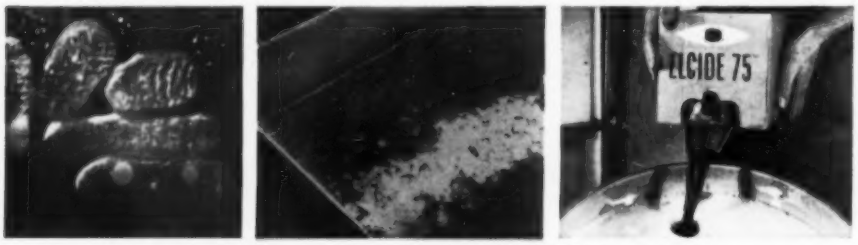
*Here's what you'll want to know about this new bacterial inhibitor for soluble oil emulsions:*

**Q: What is Elcide 75?**

A: Elcide 75 is a new bacterial inhibitor for standard duty soluble oil emulsions. Chemically, it is a combination of Sodium Ethylmercuri Thiosalicylate (Thimerosal) and Sodium *o*-phenylphenate in a concentrated solution.

**Q: What does Elcide 75 do?**

A: Elcide 75 controls bacteria that contaminate soluble oil emulsions. Since both chemical ingredients are anti-bacterial agents, Elcide 75's double action controls a far wider range of bacteria than the commonly used germicides.




Bacteria like these prematurely spoil emulsions. Elcide 75 stops their damage.

**Q: Why is bacteria control important?**

A: Bacteria enter emulsions through the air, water, and plant debris. They multiply rapidly and cause odor, corrosion, and premature emulsion breakdown. This compounded damage costs millions of dollars each year in higher maintenance and production costs. Bacteria control reduces these expenses.

**Q: How does Elcide 75 lower operating costs?**

A: The use of Elcide 75 can increase emulsion life as much as 5½ times. You use less soluble oil. Fewer man-hours are spent servicing machines and disposing of waste oil. And, because machines run longer between emulsion changes, production is increased proportionately.

**Q: What is the exact dollar return from Elcide 75?**

A: No exact figure can be established because conditions vary between plants. The type of metal, machines, and operations involved, the coolant, and general plant housekeeping are all factors that help determine savings due to Elcide 75. The best way to measure its value is to try Elcide 75 and compare the results with untreated machines under your plant conditions.

**Q: How is Elcide 75 used?**

A: One ounce of Elcide 75 is added to each four gallons of emulsion. You know you have a safe, effective treatment because you control the dosage.

**Q: Is Elcide 75 safe to employees?**

A: Yes. It also eliminates objectionable odors and certain bacteria that may cause skin infections.

**Q: Will Elcide 75 harm machinery or products?**

A: No. In fact, Elcide 75 controls bacteria that often cause acidic corrosion and shortened tool life.

**Q: Is more information available on Elcide 75?**

A: Yes. Complete data on compatibility, disposal, stability, safety, and other pertinent factors are available on written request.

**Q: Where can I buy Elcide 75?**

A: Elcide 75 is sold only through selected distributors. To place your order, or for the name of your nearest distributor, write Eli Lilly and Company, Agricultural and Industrial Products Division, Indianapolis 6, Indiana; or telephone MElrose 6-2211.

**ELCIDE 75**™

PATENT PENDING

KEEPS COOLANTS FRESH AS A DAISY!

| Package | Price per Gal. |
|---|---|
| 1-gal. (4 per case), polyethylene | $8.50 |
| 5-gallon, polyethylene | $8.00 |
| 55-gallon, stainless steel | $6.50 |

(Lilly's brand of bacterial inhibitor for cutting fluids)

ELI *Lilly* AND COMPANY • AGRICULTURAL AND INDUSTRIAL PRODUCTS DIVISION • INDIANAPOLIS 6, INDIANA

# NICE

## ...for Good Reasons

- NICE offers complete lines of precision, semi-precision and unground standard bearings.
- NICE offers facilities and "know-how" to design and produce "specials" to exactly suit individual bearing application requirements.
- NICE standard and special bearings offer Product Designers many design improvement and cost-saving opportunities.
- NICE Bearings have proved their economic and performance value in the accepted products of many hundreds of well-known manufacturers.

### CATALOG STANDARD BEARINGS

Typical "1600" Series Low Cost Precision Radial Bearings and "3000" Series Unground "Precision Type" Radials, Metal Shielded or Open, or with Composition Seals, Inch Sizes. Also "C" Series Precision Radial Bearings Metal Shielded or Open in established Light Duty Inch Standard Sizes. All Solid Inner and Outer Race Type with Retainer, as illustrated.

Another Typical Nice Catalog Standard, Inexpensive "500" Series Unground Radial and Thrust Bearings, Full Ball Type, Pressed Cone, Soft Outer Band, Inch Sizes.

Catalog Standard "600" Series "Steering Knuckle" type Self-contained Unground Thrust Bearings, Full Ball Type, Soft Outer Band, Inch Sizes.

### SPECIAL BEARINGS

No. 7235-H Forage Harvester Cam Follower is typical of NICE experience and ingenuity as "Specialists in Specials". This relatively inexpensive one-piece assembly replaces a precision bearing with separate bolt and separate outer tire. A unique, but simple seal design* effectively retains lubricant and excludes dust, dirt and moisture under the difficult conditions of operation typical of farm implement service. No. 7235-H is also an example of the well applied use of the UNIBAL principle of construction.

## The New UNIBAL® Ball Bearing

NICE now offers the revolutionary new UNIBAL, a low cost bearing of superior quality, suitable for many precision bearing applications. UNIBAL construction* features solid inner and outer raceways, with deep, unbroken ball grooves and a full complement of balls. Unique new manufacturing methods produce bearings of exceptional durability and strength.

*Patent Applied For

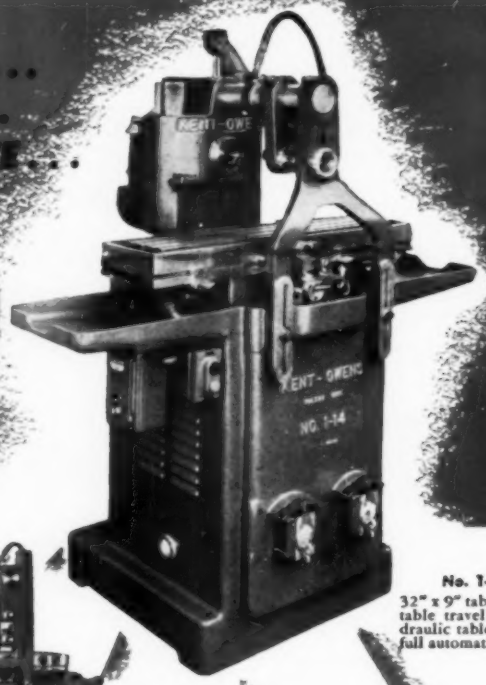
*Your Inquiries Invited.*

NICE®

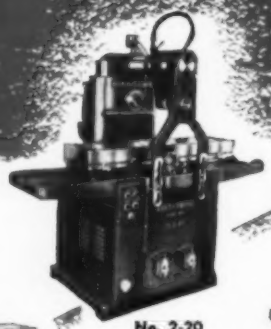
**NICE BALL BEARING COMPANY**
NICETOWN · PHILADELPHIA · PENNSYLVANIA
DIVISION OF CHANNING CORPORATION

# EXTRA RUGGED... SPEEDY... ACCURATE...

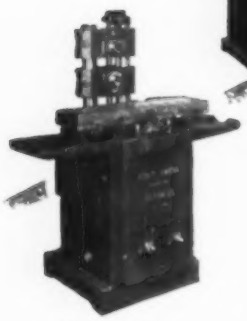
## to Bring Down Milling Costs!



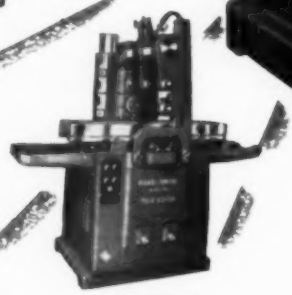

**No. 1-14**
32" x 9" table ... 14" table travel . . . hydraulic table feed . . . full automatic cycle.



**No. 2-20**
20" table travel... 42" x 12" table.. fully automatic hydraulic table feed.

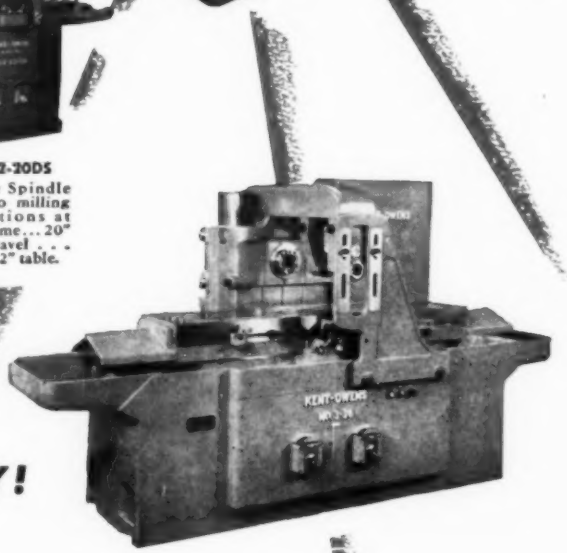


**No. 1-14DS**
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.



**No. 2-20DS**
Double Spindle for two milling operations at same time... 20" table travel . . . 42" x 12" table.

**No. 2-20V**
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.




**No. 3-36 . . . 36" table travel . . . 64" x 16" table . . . full automatic hydraulic feed.**

## STEP UP SPEED and ACCURACY!

Put the work on Kent-Owens Machines for top-speed milling and topmost accuracy to keep your costs at a minimum! Advanced features throughout make the difference . . . greater dependability . . . accuracy maintained. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to spindle. Write for bulletin #757 on wide range of hydraulic and hand-operated machines. Let us quote on proper machine complete with tooling for your operation. Also, call on Kent-Owens for special machines. Kent-Owens Machine Co., Toledo, Ohio.

**KENT-OWENS**
*for milling machines*

### KENT-OWENS REPRESENTATIVES

BOSTON
General Machinery Corp.

BUFFALO
Beesley Hoffmann Mach'y Co.

CHICAGO
Four States Mach'y Company

CLEVELAND
Garco Machinery, Inc.

DALLAS
Hunter Machine Tool Co.

DAYTON
C. H. Gossger Mach'y Co.

DETROIT
A. C. Habertoru Mach'y Co.

FT. WAYNE
Ostco Machinery Co.

GRAND RAPIDS
Joseph Monahan & Co.

HAMILTON, ONT.
F. F. Barber Mach'y Company

HARTFORD
Herrington Wilson Dunn Corporation

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
Ostco Machinery Co.

KANSAS CITY
Eichman Machinery Co.

LOS ANGELES
Machinery Sales Co.

MILWAUKEE
Four States Mach'y Company

MINNEAPOLIS
The Satterlee Company

MOLINE
John J. Normoyle Co.

MONTREAL
F. F. Barber Mach'y Co.

NEW ORLEANS
Oliver H. Van Horn Co., Inc.

NEW YORK
Herrington Wilson Dunn Corporation

OMAHA
The Bulbach Co.

PHILADELPHIA
Calco Machinery Company

PITTSBURGH
Barnes Machinery Company

ROCHESTER
Schiefer-Phipps Machinery Corp.

SAN FRANCISCO
Bolton Machinery Co.

ST. LOUIS
Wm. Scherr Company

SEATTLE
Starbuck Machine Tool Co.

SYRACUSE
J. F. Owens Mach'y Company

TORONTO, ONT.
F. F. Barber Mach'y Company

WINDSOR, ONT.
F. F. Barber Mach'y Company

# SHAFTEX speed reducer combines flexibility and dependability

Output speeds from 10 to 400 rpm, horsepower ratings from ½ to 40 — that's the scope of Allis-Chalmers line of *Shaftex* speed reducers, the last word in shaft-mounted power transmission drives.

*Shaftex* reducers couple flexibility with dependability. You may specify single or double reduction; you have a choice of tie rod or flange mountings.

*You get these features for dependability:*

**Hardened gears** are of single helical construction and rated to AGMA standards.

**Reversible shaft** features hollow-through low-speed shaft open at both ends for reverse assembly . . . can be mounted easily on driven shaft.

**Positive oil seals** keep oil in, dirt out.

**Cast-iron housing** assures precise alignment of components.

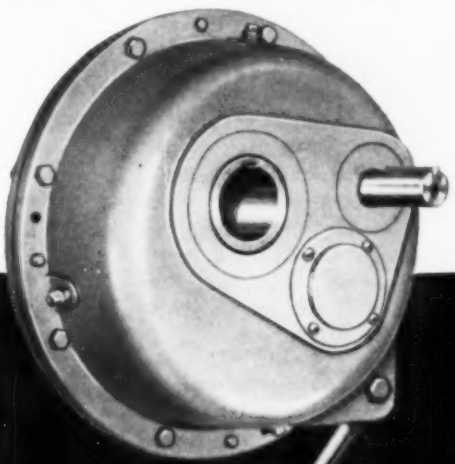
**Splash lubrication** provides continuous spray of oil to all moving parts.

**Optional features** available include overload releases and backstops. *For full details, contact your A-C representative or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.*

*Shaftex and Vari-Pitch are Allis-Chalmers trademarks.*

**ALLIS-CHALMERS**

A-5982-G1

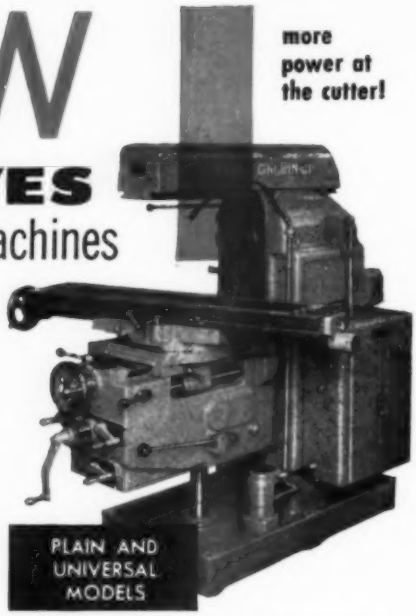


**Built-in flexibility.** Use the *Shaftex* reducer with flanges or tie rod . . . mounted angularly, vertically or horizontally. Locate motor where you want it. For speed variation, merely change the sheave size or use *Vari-Pitch* sheaves.

**Simple belt tensioning.** No need to adjust a motor base. Split-second tensioning is accomplished by a tie rod turnbuckle. This same device allows for fast belt change when required.

# new GREAVES 2-XH Milling Machines

**more power at the cutter!**




The completely new GREAVES No. 2-XH Milling Machine brings added versatility, increased operational ease, and more power where it's needed most . . . *at the cutter!*
It utilizes two motors, one for spindle drive; a separate motor for moving table, saddle and knee. Compare this and the other outstanding features of the new Greaves Mill. You'll see why Greaves is "The MOST Mill for the LEAST Money."

*Write for detailed literature!*

- Wide range of speed/feed combinations for any type material, any type job.
- Heavy, internally ribbed column casting and heavy duty rectangular overarm for maximum rigidity.
- Large, heavy-duty knee, saddle and table provide accuracy for all types of milling.
- New 7½ HP spindle drive motor, with separate motor for movable components, provides extra power for heavy milling.
- Easy-to-reach controls. Handwheels and vertical crank disengage automatically when not in use.
- New rapid traverse lever within operating control area.
- Separate drive motor for table, saddle and knee provides more smooth balanced power at the cutter.

GREAVES

**J. A. FAY & EGAN COMPANY**
**2100 Eastern Avenue, Cincinnati 2, Ohio**

CIRCLE 379 READER SERVICE CARD

## ADDITIONAL MARKET DATA AVAILABLE FROM THE AMERICAN MACHINIST INVENTORY

Statistics collected for American Machinist's unique census of metalworking equipment have been tabulated on IBM cards. Special runs to fit the inventory to your needs are now possible for a nominal fee. Write for complete information.

**American Machinist Market Dept.**
**330 W. 42nd ST., N. Y. 36, N. Y.**

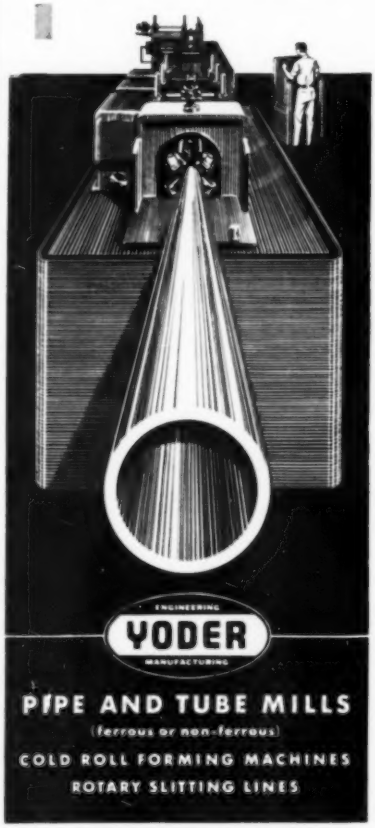
# YODER

## Pipe and Tube Mills

Product dependability—integrity of manufacture—engineering for specific production needs have all contributed to establish Yoder equipment as the industry standard of excellence. Since 1909 Yoder-built machinery, including Pipe and Tube Mills, Roll Forming Equipment and Rotary Slitters, have earned world-wide customer satisfaction and recognition.

Profit from Yoder's years of engineering and service experience. Send today for the illustrated Yoder Pipe and Tube Mills Book.

**THE YODER COMPANY**
**5519 Walworth Ave., Cleveland 2, Ohio**




CIRCLE 380 READER SERVICE CARD

# "This is our fourth plant expansion"

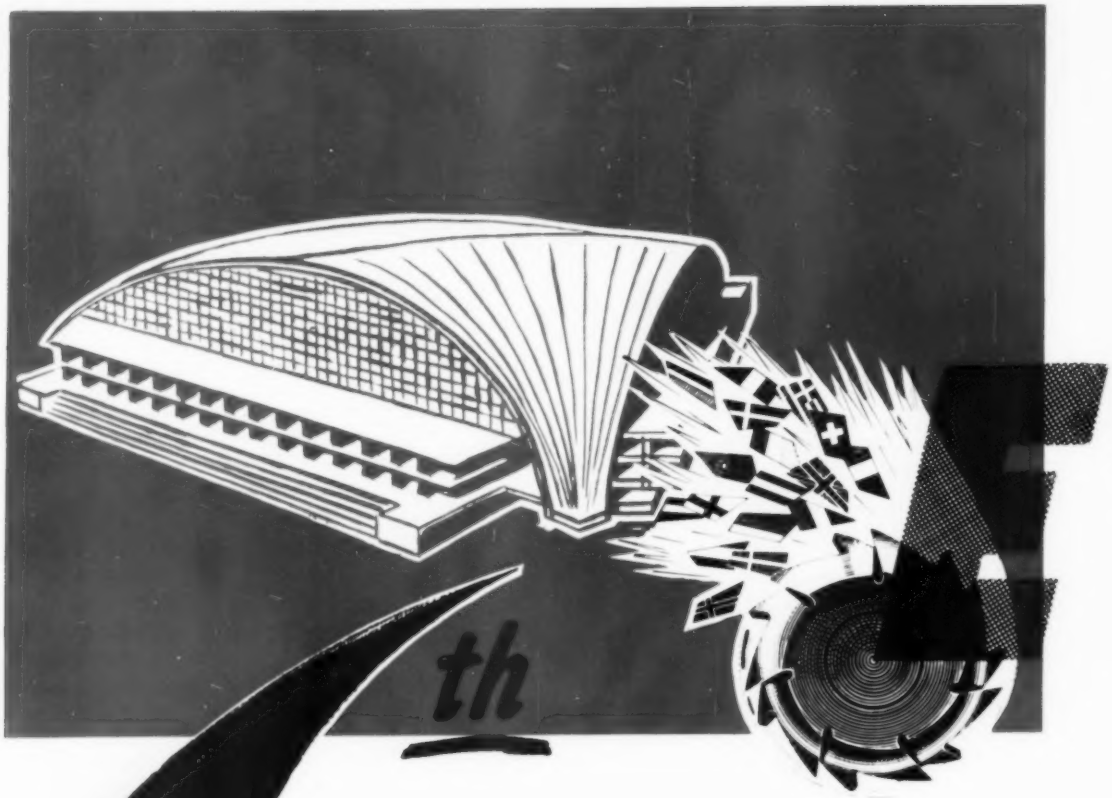
"When I joined the company in 1935, the whole plant was in the building where Inspection and Shipping are now. Production was handled like single jobs. But new equipment has changed all that. Now, with only three times as many men, we're turning out 10 times the volume we did in '35. And we're still growing."

This kind of seam-bursting growth has made Metalworking a $120 billion industry; has made its production management vitally important. For these men supervise, plan and boss manufacturing in a dynamic field. While hypothetical, Mr. Harper is representative of production engineers and executives in Metalworking—your best customers.

American Machinist is the magazine that helps these men look ahead; helps them keep current in a fast-moving technical field. Expertly edited by experienced engineers, it's an advanced text for younger men, a sure way to keep up for the veterans. Thus, throughout Metalworking, you'll hear production men say . . .

## "I have to read American Machinist"

McGraw-Hill Magazine of Metalworking Production
330 West 42nd Street, New York 36, New York



# 6th EUROPEAN Machine Tool EXHIBITION

PARIS
SEPTEMBER 12th to 21st 1959

*FOR INFORMATION*

**SYNDICAT DES CONSTRUCTEURS FRANÇAIS DE MACHINES-OUTILS**

150, Bᴰ BINEAU, NEUILLY-s/-SEINE - TEL. SAB. 61-90

EMILE DULAC



CIRCLE 382 READER SERVICE CARD

CIRCLE 383 READER SERVICE CARD ►

A

new concept

to simplify your spring

design and purchasing problems

# Select-A-Spring

## ready-to-use engineered standard springs

Now you can select compression or extension springs from hundreds of ready-to-use, engineered standard-specification sizes. No fuss or paper work—no blueprints or drawings necessary. Select-A-Spring enables buyer or designer to pinpoint his needs without delay. Simply match your requirements to the Select-A-Spring list, order by catalog number, quantity and material. Especially convenient where quantities are moderate.

Select-A-Springs are pre-engineered, using wire certified to military and aircraft specifications, in various lengths, diameters, rates, and loads up to 20 lb. They meet industry and military standards. Material is either music wire or stainless steel. Compression springs are squared and ground. Extension springs have regular loops. Other ends and loops optional.

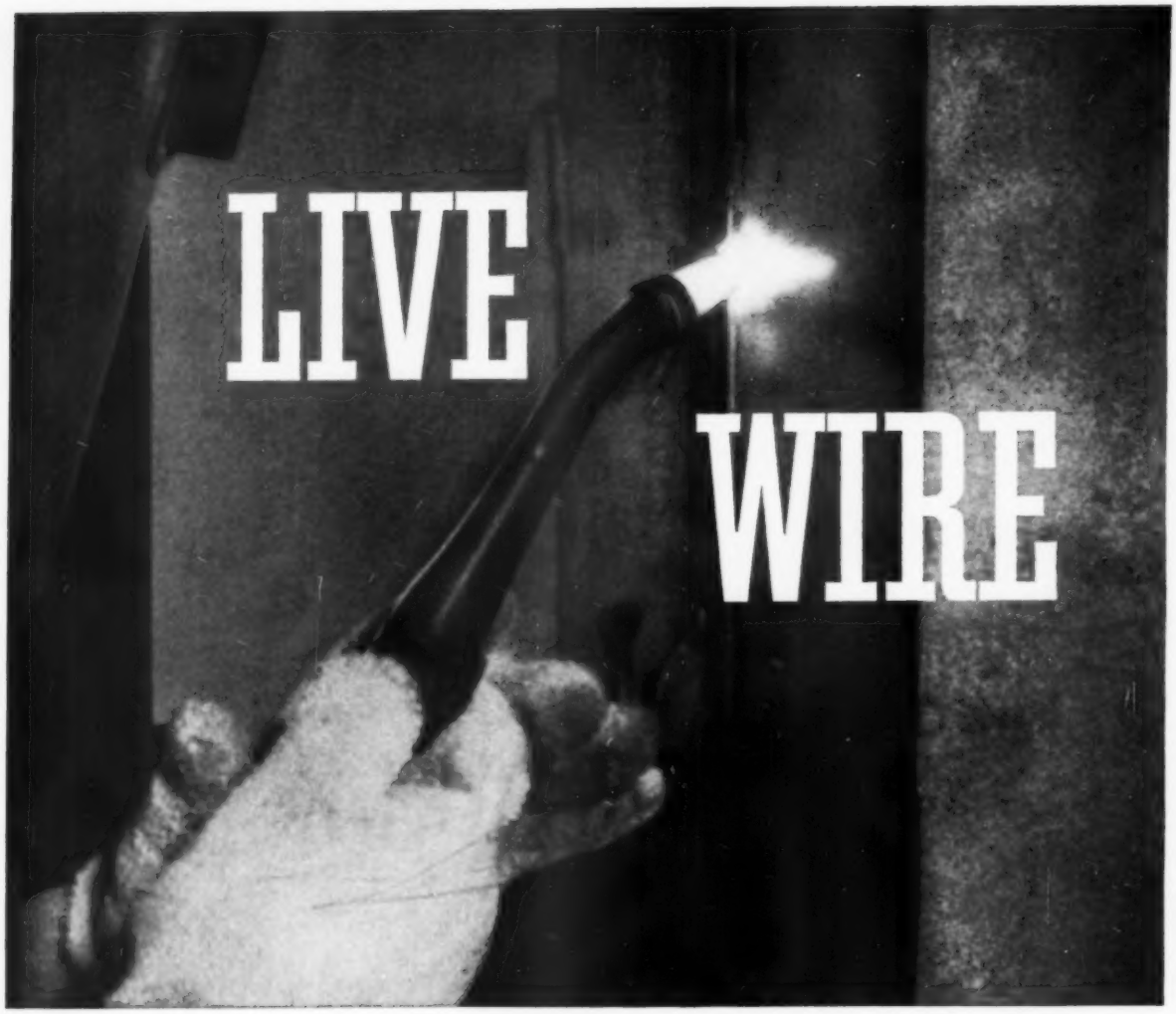
*Whether your need is immediate or future, write now for the A.S.C. Select-A-Spring list. Keep it handy as a time-saving, useful spring service.*

## Associated Spring Corporation

General Offices: Bristol, Connecticut

Wallace Barnes Division, Bristol, Conn. and Syracuse, N. Y.
B-G-R Division, Plymouth and Ann Arbor, Mich.
Gibson Division, Chicago 14, Ill.
Milwaukee Division, Milwaukee, Wis.
Raymond Manufacturing Division, Corry, Penna.
Ohio Division, Dayton, Ohio
F. N. Manross and Sons Division, Bristol, Conn.
San Francisco Sales Office, Saratoga, Calif.
Seaboard Pacific Division, Gardena, Calif.
Cleveland Sales Office, Cleveland, Ohio
Dunbar Brothers Division, Bristol, Conn.
Wallace Barnes Steel Division, Bristol, Conn.

Canadian Subsidiary: Wallace Barnes Co., Ltd., Hamilton, Ont. and Montreal, Que. Puerto Rican Subsidiary: Associated Spring of Puerto Rico, Inc., Carolina, P.R.




## New design in Sigma hand welding torches

Here is a new, lightweight torch—only 16 ounces—for manually welding light-gage steels. Sigma ST-2 welds in all positions with no change in control or current settings. Welds .030- to .100-in. sheet, using low-voltage short-arc technique with .020- and .030-in. hard-drawn wire. For 200 amp continuous service, a-c or d-c.

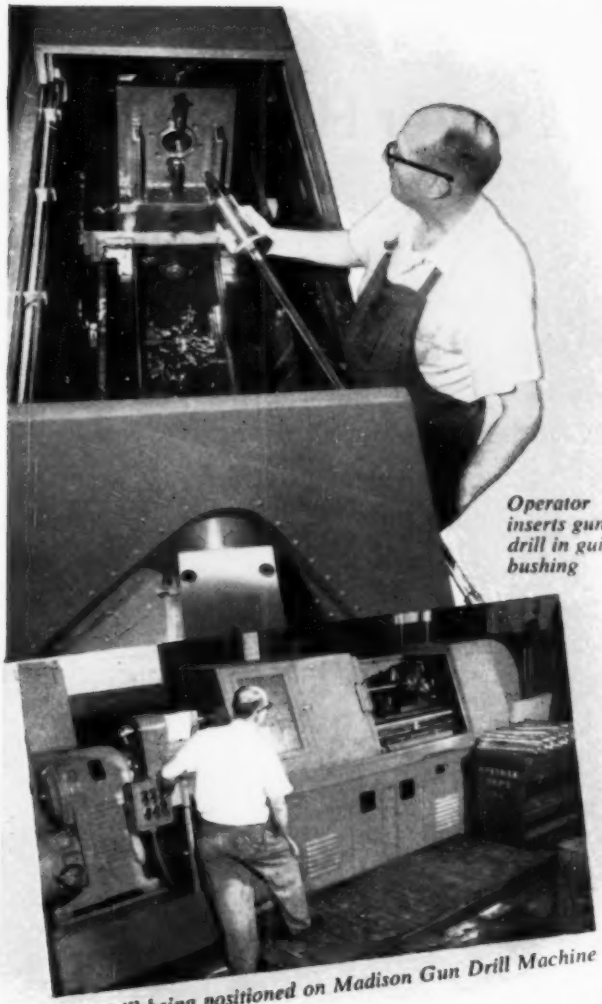
Balanced design makes handling easy. Service lines enter through rear of handle—a convenience in cramped quarters. Start-stop switch on handle, easy to reach. Nozzle has a 60° curve for maximum weld visibility.

Sigma ST-2 makes high-quality welds at high speed. Seams require no cleaning . . . distortion is at a minimum. Inert gas shielding is economical. Low flow rate—only 10 cu. ft. or less per hour—means even more savings.

Call your nearest LINDE office today for a demonstration of this new Sigma ST-2 torch! Or write Dept. AM-53, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd St., New York 17, N.Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

Linde TRADE-MARK UNION CARBIDE

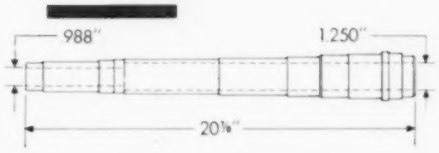
"Linde" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.



*Operator inserts gun drill in guide bushing*

*Gun drill being positioned on Madison Gun Drill Machine*

# AT *Brown & Sharpe* MADISON GUN DRILLING TOOLS and TECHNIQUES CUT SPINDLE DRILLING TIME 67%




**Brown & Sharpe Spindle**
**SAE 8615 Steel**

In manufacturing spindles for many of their world famous machines, Brown & Sharpe had to produce precision holes ranging from $1\frac{1}{16}$" to $2\frac{13}{16}$", through each spindle.

With an eye on their slogan, *Progress in Precision for over 125 years*, Brown & Sharpe called in their Madison Man. How could these holes be produced better? Cheaper?

Today, Brown & Sharpe with their new Madison gun drilling machine have cut drilling time by 67%, yielding a threefold increase in production.

## Madison Gun Drill Method

| | Min. |
|---|---|
| Gun drill .988" through hole | 11.50 |
| Gun ream 1.250" to depth | 4.25 |
| Handling time | 4.00 |
| TOTAL TIME | 19.75 minutes floor to floor |

How about your own plant? You can boost production and precision with Madison Gun Drills and Reamers on your present equipment. HOW? CALL THE MAN WITH THE HOLES IN HIS HEAD . . . YOUR MADISON MAN. HE HAS THE ANSWERS.

**FREE!**

*Get your Madison Fact File on Gun Drilling — tips and techniques on how to save money, increase production.*

*First in inner diameters*

**MADISON INDUSTRIES, INC.**

DEPT. 205, PROVIDENCE 1, RHODE ISLAND

Associated with: Madison-Faessler Tool Co. • Madison-Relco Tool Co.

# DE LAVAL
## IMO PUMPS

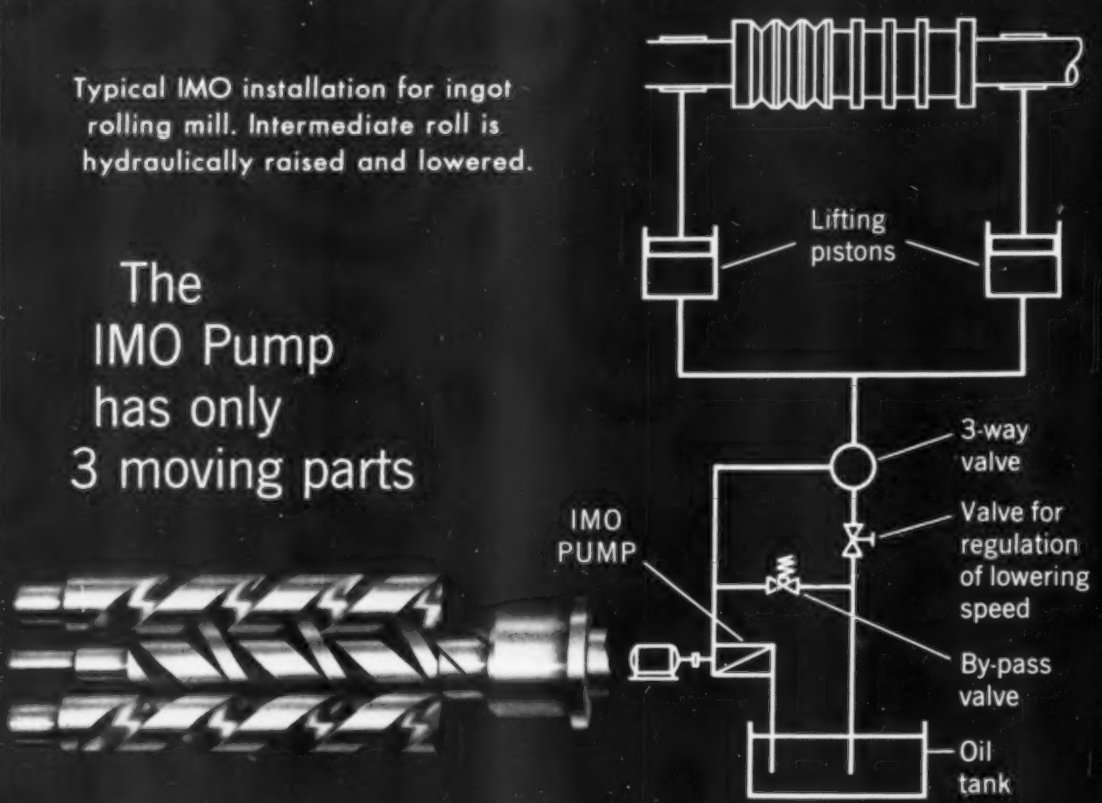
# for Power Hydraulics

If you require a hydraulic pump for actuating any kind of equipment—lifting, tipping, loading, bending, pressing, etc. —consider the IMO. Here are its characteristics:

- **Smooth power flow without pulsation**
- **Can be direct-driven at high speeds without reduction gears**
- **Thoroughly dependable and proved**
- **QUIET, smooth rolling action**
- **Easily installed**

Typical IMO installation for ingot rolling mill. Intermediate roll is hydraulically raised and lowered.

The IMO Pump has only 3 moving parts




DE LAVAL *IMO Pumps*

DE LAVAL STEAM TURBINE COMPANY
*908 Nottingham Way, Trenton 2, New Jersey*

DL-455

# YOU'RE JUST A FINGER-TWIST AWAY FROM ALCOA ALUMINUM FASTENERS

IF YOU can dial a telephone, you have just about all the "inventory control" you'll ever need to keep you stocked up with Alcoa® Aluminum Fasteners. For, thanks to Alcoa's unmatched distribution facilities, there's a *local* distributor near you with full stocks of Alcoa Fasteners in standard sizes and types . . . to be delivered in a jiffy!

And, of course, Alcoa Aluminum Fasteners are a sound choice in *any* case. Bright, flawless finish adds extra appeal to your product at the time of purchase—and won't stain it or mar it any time *after* purchase. Moreover, as everyone knows, you always get *full* count, *full* quality when you specify Alcoa—whether you order a hatful or a carload!

So don't worry if stocks run short. Look up your local distributor in the Yellow Pages of your phone book. Call him. He'll give your order *action* at the local level almost before you can hang up! *P.S.:* For additional facts and samples of Alcoa Aluminum Fasteners, just mail the coupon below.

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM

For Exciting Drama Watch "Alcoa Theatre" Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

Free . . . Facts, Samples . . . Free

Aluminum Company of America
2000-E Alcoa Building, Pittsburgh 19, Pa.

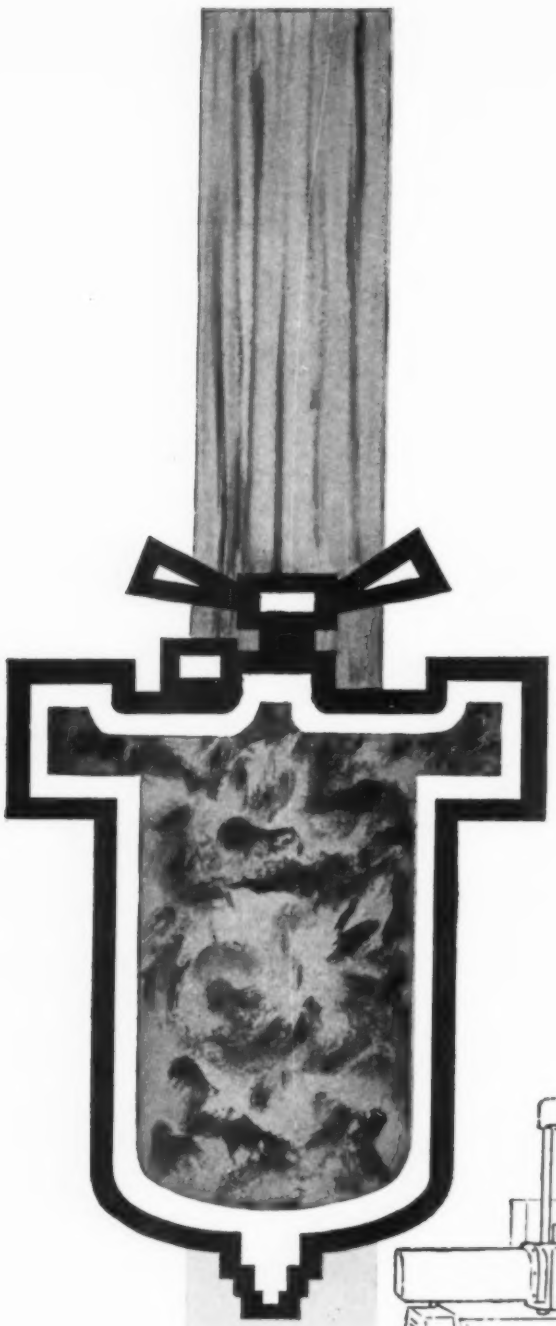
Gentlemen: Please send complete specification data and samples of Alcoa Aluminum Fasteners.

Name _____

Title _____

Company _____

Address _____

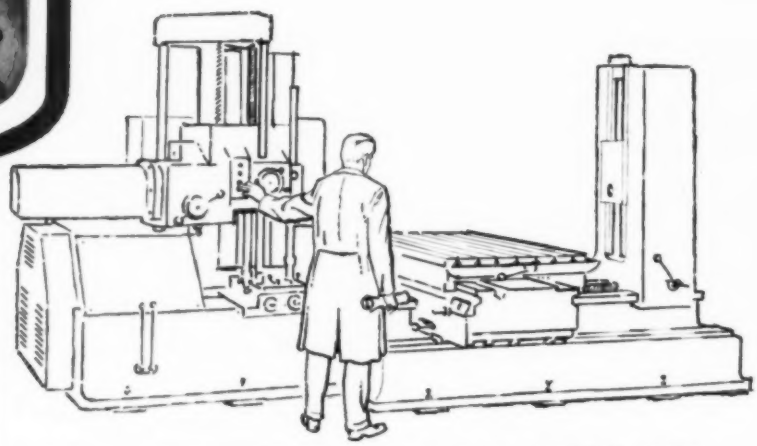


# whatever the **machine tool application . . .** you can depend on **CUNO** engineered filtration

CUNO Filters are vital to the efficient operation of machine tool lubrication, hydraulic, and coolant systems. By removing damaging particles, they help reduce maintenance and replacement costs by protecting bearings, gears, valves, pumps, controls, etc. . . . help improve the quality of the product being manufactured.

Depending upon the specific application, CUNO offers you three basic filter types . . . CUNO Positive Self-Cleaning Edge-Type, CUNO Automatic Self-Cleaning Wire Wound Type, CUNO Disposable Depth Cartridge Filter . . . available in a variety of housings to meet *any* flow requirement.

Whenever *you* have a filtration problem—involving either a built-in application or a centralized system—write us. Our engineers will welcome the opportunity to demonstrate how you can *depend on* CUNO.



CUNO

**THE CUNO ENGINEERING CORP., Dept. 10, MERIDEN, CONN.**

*A Leader in Industrial Filtration for More Than 30 Years*

In Canada: Peacock Bros., Ltd., P. O. Box 1040, Montreal 3, P.Q.

# WHEN PRECISION PRODUCTION RIDES THE HOOK...

On a crankshaft production line, even slight damage to a crankpin can mean an expensive piece of scrap — something no manufacturer can afford.

That's why this manufacturer uses *close-spotting* P&H Zip-Lifts.

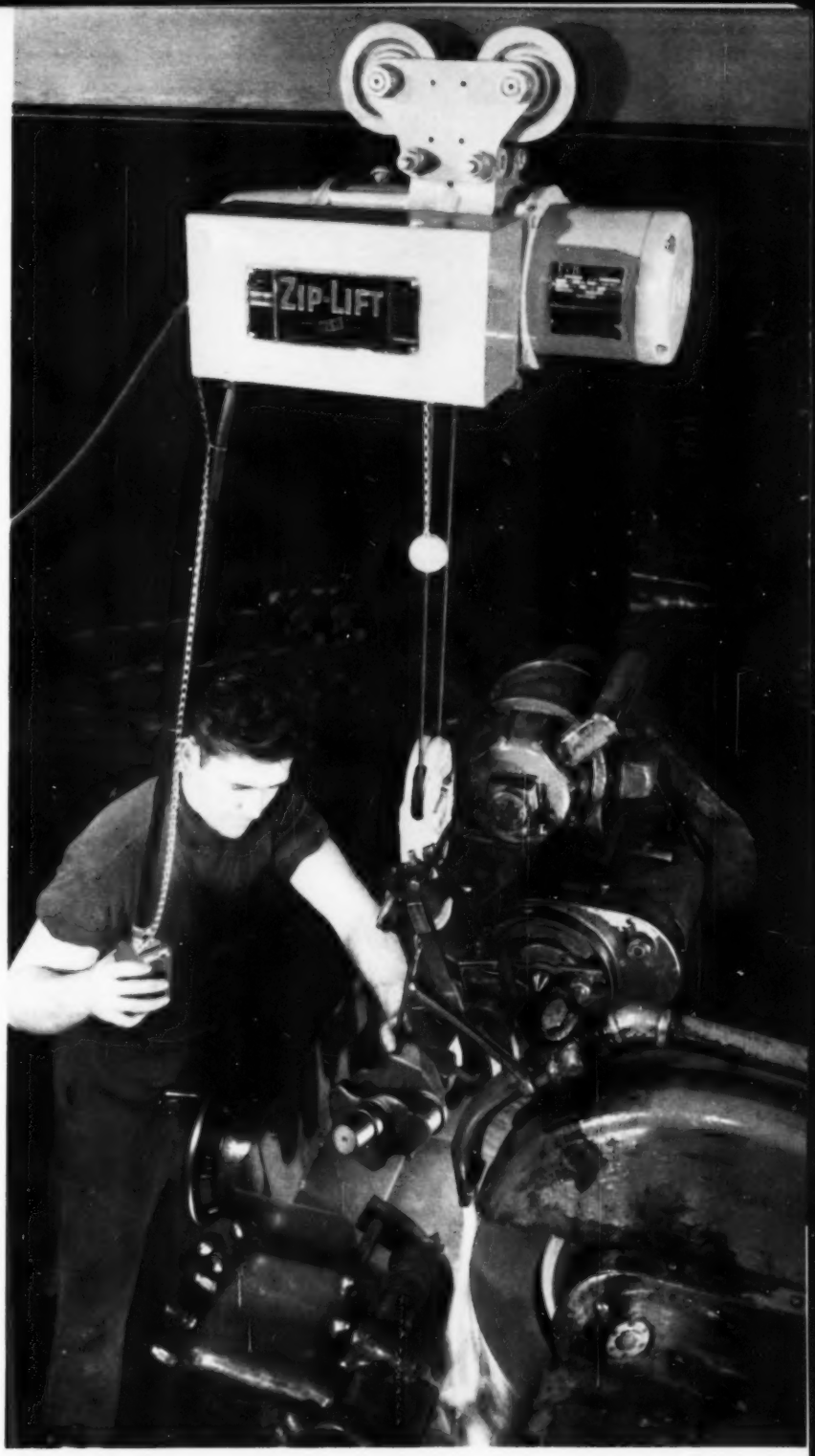
Where every movement is made with hoists, a hoist breakdown means lost production — something no manufacturer wants.

That's why this manufacturer uses *dependable* P&H Zip-Lifts.

And human beings need protection — against electric shock, mechanical failure, poor construction, and other hazards.

That's why this manufacturer uses *safe* P&H Zip-Lifts.

Are *you* now using close-spotting, dependable, safe P&H Zip-Lifts — or are you one of the group of hoist users who is about to switch over to them? Capacities from 250 to 2000 lbs., your choice of mountings. Priced from $200. Write for Bulletin H-20, Dept. 201, Harnischfeger Corp., Milwaukee 46, Wisconsin.




P&H HARNISCHFEGER
...quality and service for 75 years

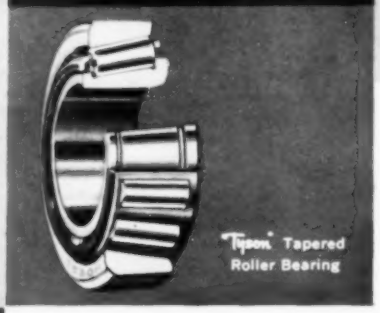
OUR 75TH YEAR

# What's "special" about these standard SKF bearings?

*Cylindrical Roller Bearing

Single Row Deep Groove Bearing

Spherical Roller Bearing



"Tyson" Tapered Roller Bearing

Spherical Roller Thrust Bearing

Angular Contact Bearing

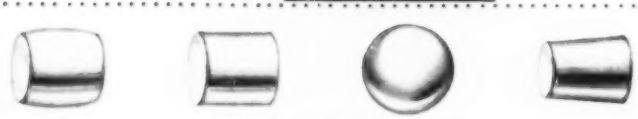
SEE THEM AT THE
DESIGN ENGINEERING SHOW
MAY 25-26
SKF BOOTH #618

They all have exclusive features. Where else, for example, can you get the 33⅓% higher capacity available in standard SKF spherical roller bearings?

*Or, take the cylindrical roller bearing. This type provides high radial capacity and minimum shaft friction. Controlled shaft end float within the bearing is a natural advantage of this design.

Yet this is SKF's standard cylindrical roller bearing, promptly available in 154 sizes ranging from just under 1" to 6" (bore). In the double row it's 1" to 9.5".

Why not get the complete facts on these "special" but standard (and economical) bearings? For details, call any of the 25 SKF sales offices today. 5923



*Spherical, Cylindrical, Ball, and "Tyson" Tapered Roller Bearings*

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES INC. PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.

PHOTO BY KAREN OF OTTAWA

## "The Sharon kind of steel quality eliminates a big production problem"

—JAMES E. STILES, vice president of production, Macomber Incorporated, Canton, Ohio.

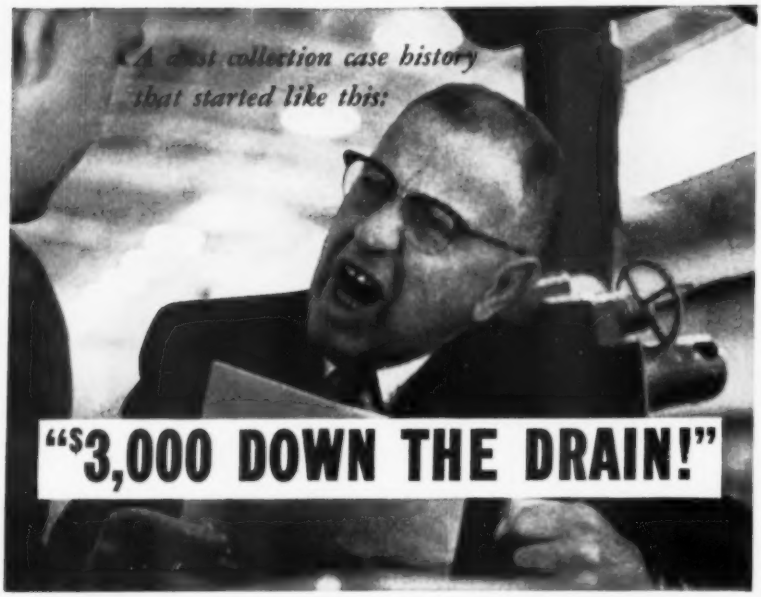
"Into each of our finished products goes hundreds of pounds of steel, a great deal of manpower, and the Macomber reputation for rugged dependability," says James E. Stiles, vice president of production at Macomber, one of America's leading producers of steel joists, roof decking, and structural steel framing.

"For this reason our supply of mill steel must meet our specification as a single inch of bad steel can cost us hundreds of dollars. Over the years we have learned to depend on the consistent quality of steel from *Sharon Steel Corporation, Sharon, Pa.*"

SHARONSTEEL

**SHARON** *Quality* **STEEL**

CIRCLE 391 READER SERVICE CARD




# "Get rid of that DUST!"

"The boss was sore and I was on the spot.

"He shoved the report from the efficiency engineer at me. I read it: 'Yearly loss due to machine wear, misalignment and down time . . . $3,000. Major cause . . . abrasive dust.'

"The boss pointed his finger at me, 'Get rid of that dust and get rid of it fast!' "

### Now, it was my problem, and I was on the spot.

"First thing I did was to check into a central dust collecting system. But the lowest bid I could get was $8,000. Too much.

"Then I came across a Torit ad, offering economical portable dust collectors.

"Two days after my call Torit engineers showed me how in only one week they could install a portable, unitized Torit Dust Collector at each of our eight grinders, trapping dust right at its source—cleaning the air throughout the entire plant.

"Total cost? Only $2400.00. That's a $5,600.00 saving over the lowest priced central system.

"You guessed it—we installed the eight Torit Collectors."

### Torit solved my problem

"This year when we received our report it read: 'Loss due to machine wear, misalignment and down time...$340.00.' A saving of $2,660.

"This time the boss was all smiles. He slapped me on the back, 'Charlie, you did a fine job getting rid of that dust. Frankly, I didn't think it could be done with such a small investment.'

"Now there's a pretty nice fellow to work for.

"If you've got a dust problem, or are about to have one, write the Torit people. They've manufactured and sold more dust collectors than anyone else in the U.S.A. Chances are they can help you the way they helped us."

**TORIT** manufacturing company

Dept. 411, Walnut & Exchange Sts., St. Paul, Minn.



CIRCLE 392 READER SERVICE CARD

One order, one source
*. . . every fastener need*

# Eliminate delayed deliveries!

Production line techniques require positive deliveries and fast service. Orders for So-Hard standards are processed for shipment the day they are received. This specialized service backs up distributor supplies—eliminating delayed deliveries.

For added measure, famous So-Hard fasteners have proven their worth—for nearly a century. Whether you order by the carload or by individual packages, there'll be no rejects, no seconds . . . only quality precision-made products. Specials on order.

VMA 6541

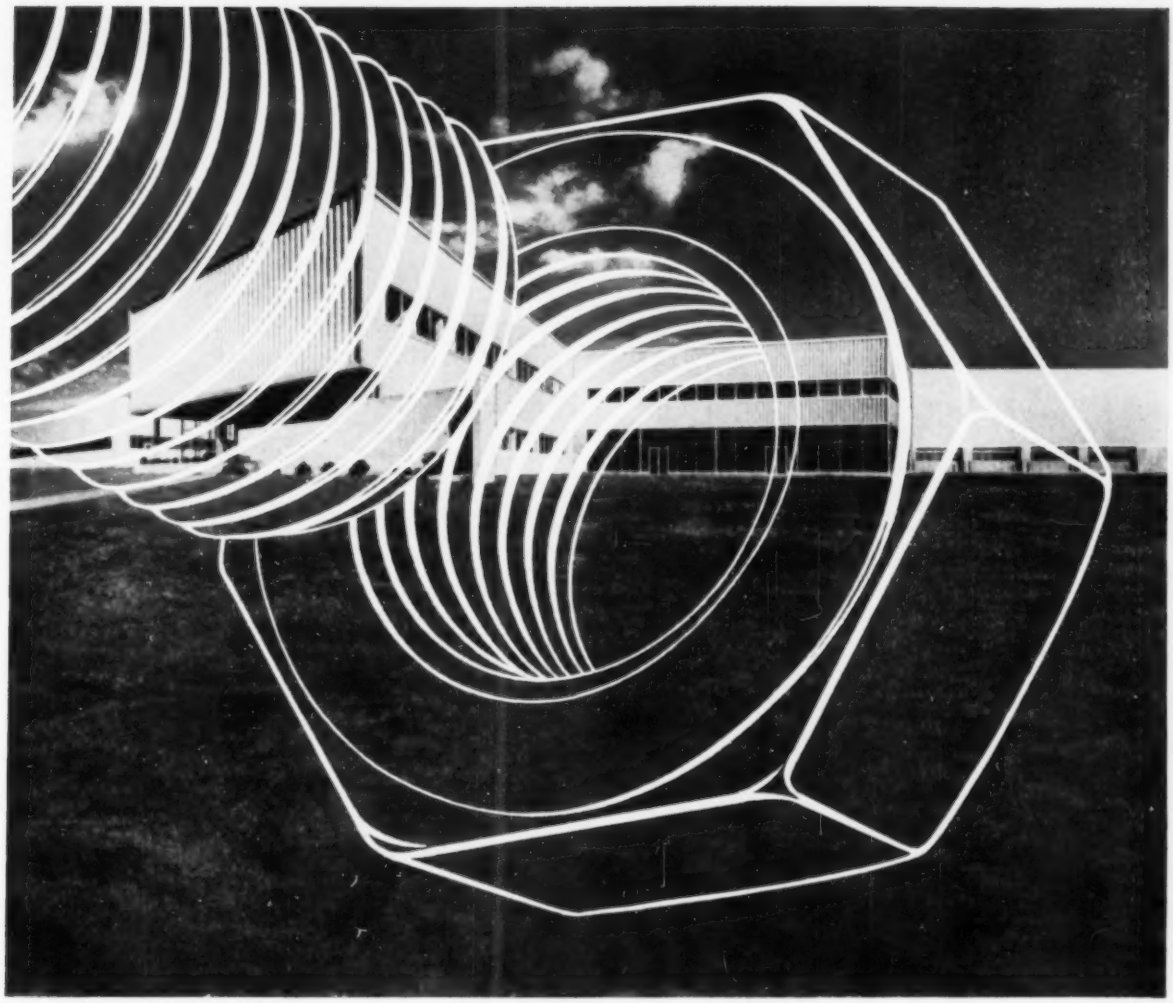
**SCREW AND BOLT CORPORATION OF AMERICA**
P. O. Box 1708
Pittsburgh 30, Pa.

*Formerly Pittsburgh Screw and Bolt Corporation*

SERVES THE NATION

America's Most Complete Line of Industrial Fasteners

CIRCLE 393 READER SERVICE CARD



# A new name for a dependable old friend

On April 15, Pittsburgh Screw and Bolt shareholders voted to change their company's name to Screw and Bolt Corporation of America.

This new name clearly reflects our continuous expansion and diversification to service the ever increasing and rapidly changing needs of our customers. Today, with four major divisions and plants from Texas to Connecticut, our national scope of business has earned for us the reputation as producers of "America's most complete line of industrial fasteners."

In keeping with this progress, our new, fully integrated Pittsburgh plant, covering—under a single roof—an area equivalent in size to ten football fields . . . offers the utmost in operating efficiency. It is representative of the modern facilities and up-to-date production techniques that keep our quality tops and our service prompt.

We are happy to announce this name change to our many friends and look forward to serve you under our new banner . . . Screw and Bolt Corporation of America.

VMA 6710

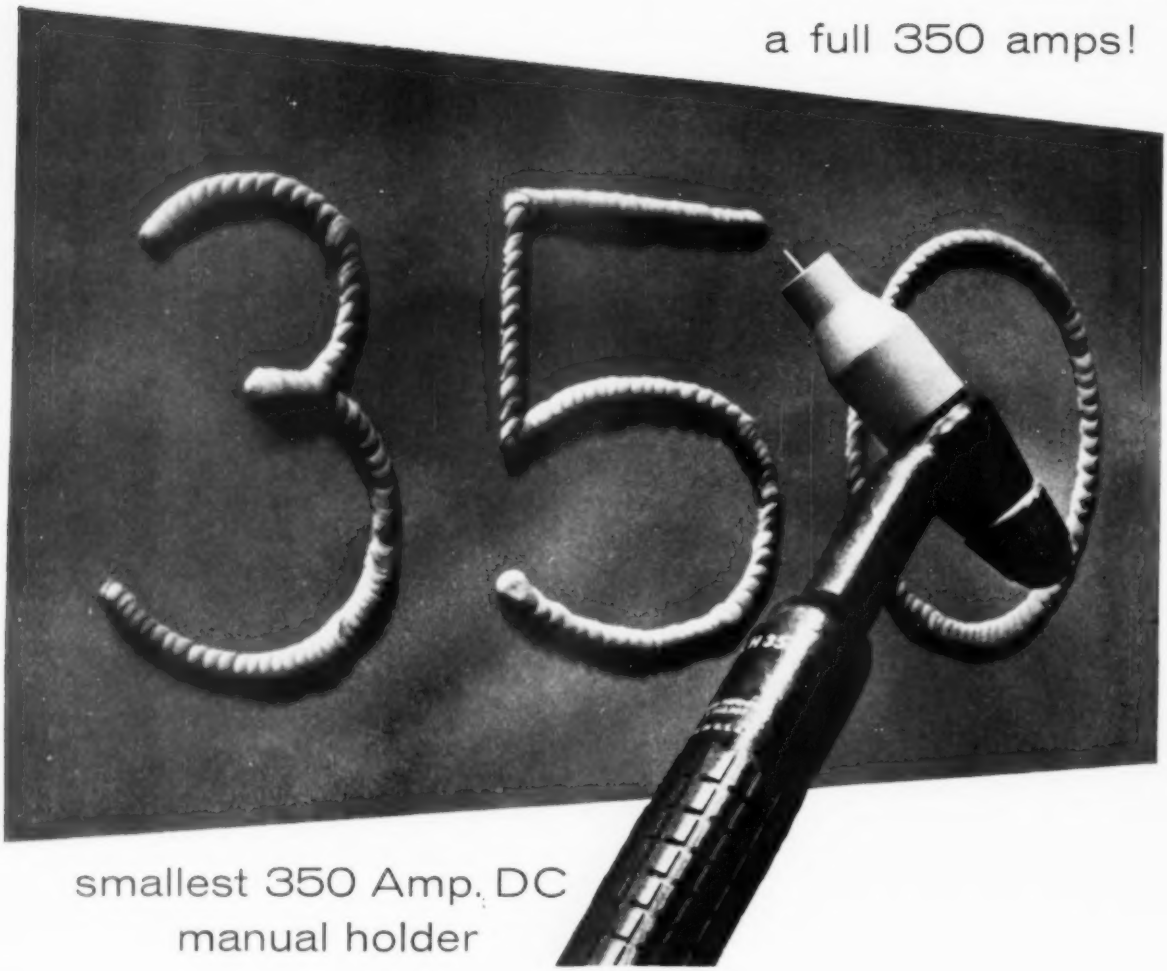
**SCREW AND BOLT CORPORATION** SERVES THE NATION **OF AMERICA**

*Formerly Pittsburgh Screw and Bolt Corporation* • P. O. Box 1708 Pittsburgh 30, Pennsylvania

**DIVISIONS:** Pittsburgh · Gary Screw and Bolt · Southington Hardware · American Equipment

AMERICA'S MOST COMPLETE LINE OF INDUSTRIAL FASTENERS

a full 350 amps!




smallest 350 Amp. DC
manual holder

# AIRCO'S H35-B HELIWELD HOLDER

## new design • new light weight • new economy

Using tungsten electrodes as short as 2" in length, the brand new Airco H35-B Manual Heliweld Holder can go to work in more confined spaces than any other holder.

It operates at a continuous duty rating of 350 amperes DCSP, or 300 amperes AC.

With a new Airco H35-B in hand you can heliweld stainless steel, aluminum, copper, magnesium and other alloys and metals . . . from paper-thin gauge to 1 8" or more, depending upon the metal and current you use. Special body material insulates against high temperatures.

The Airco H35-B does the job at lower operating cost. Stub loss can be as little as 13 16". Metallic nozzles are not needed. Reduced gas flow saves you money. Less down time, because there's no high frequency leakage. Connections are a breeze. For information see your Authorized Airco Dealer. He's listed in the Yellow Pages. Or, contact Airco direct.

AIRCO®

**AIR REDUCTION SALES COMPANY**

**A division of Air Reduction Company, Incorporated**

**150 East 42nd Street, New York 17, N. Y.**

Offices and authorized dealers in most principal cities

**On the west coast**—
Air Reduction Pacific Company

**Internationally**—
Airco Company International

**In Cuba**—
Cuban Air Products Corporation

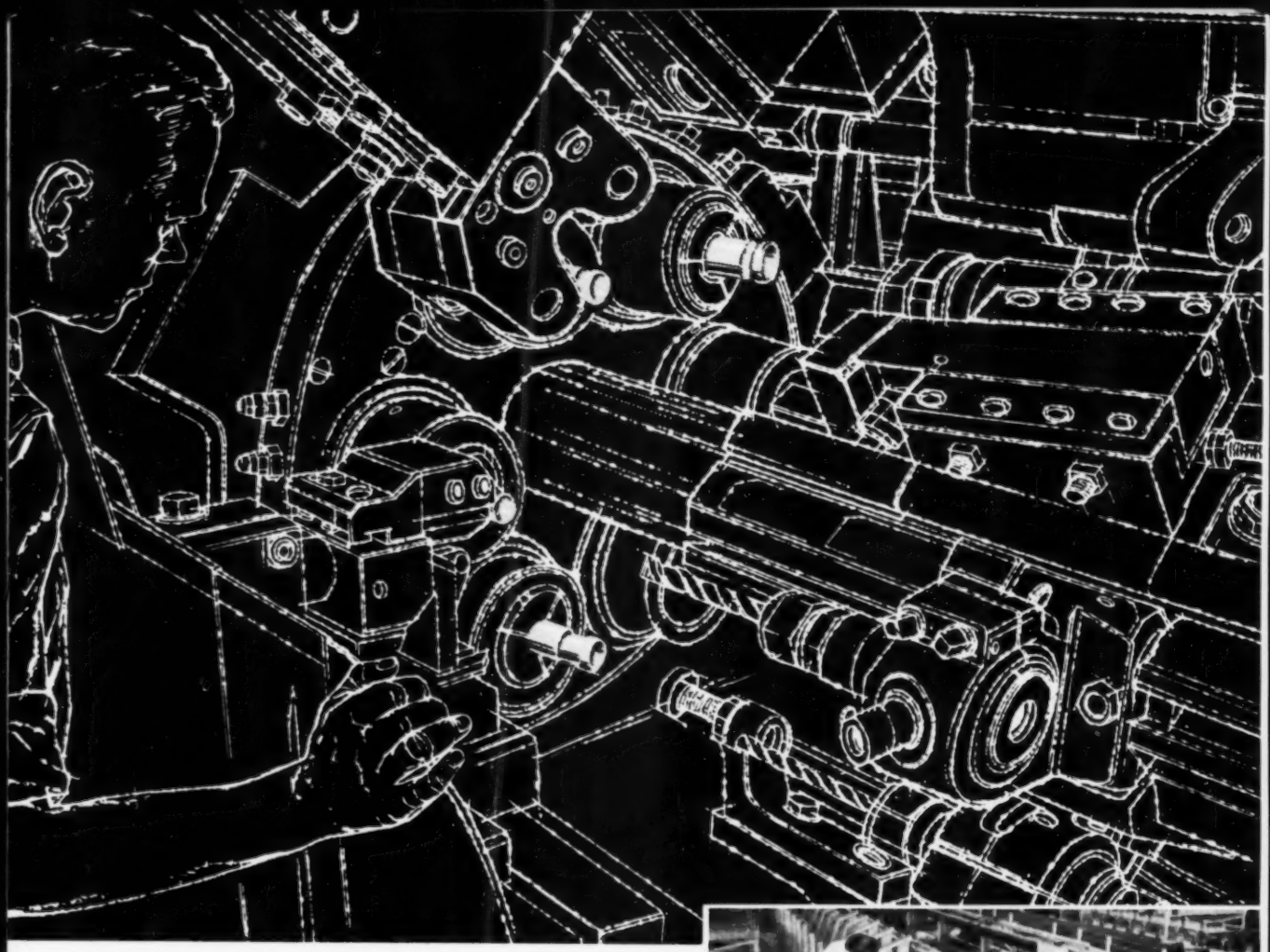
**In Canada**—
Air Reduction Canada Limited

All divisions or subsidiaries of Air Reduction Company, Inc.



CIRCLE 395 READER SERVICE CARD

CIRCLE 396 READER SERVICE CARD ►



# The Ultimate Test

The ultimate test of quality in stainless steel bars takes place in screw machine production, where every bar is literally cut to pieces.

The Perry-Fay Company, Elyria, Ohio, a leader in screw machine production, has been subjecting J&L bars to this demanding production-line test for more than a year, **without a single failure, without a single reject.** Perry-Fay reports: "We consistently get superior surface finish, closer tolerances, fully formed rolled threads with J&L stainless bars."

Whether you need stainless steel bar stock for high-speed, high-production operations, or a single bar for extraordinary requirements, turn to J&L. J&L leads the industry in melt shop standards for stainless steel, the point where quality starts—and new production profits begin.

Careful attention to every production detail is the key to J&L quality.

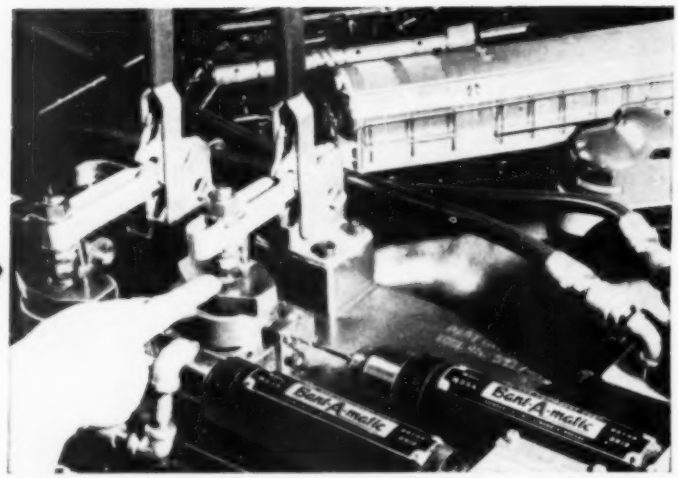
J&L STAINLESS
SHEET • STRIP • BAR • WIRE

*Plants and Service Centers:*
*Los Angeles • Kenilworth (N. J.) • Youngstown • Louisville (Ohio) • Indianapolis • Detroit*

**Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34**

# Your Choice!

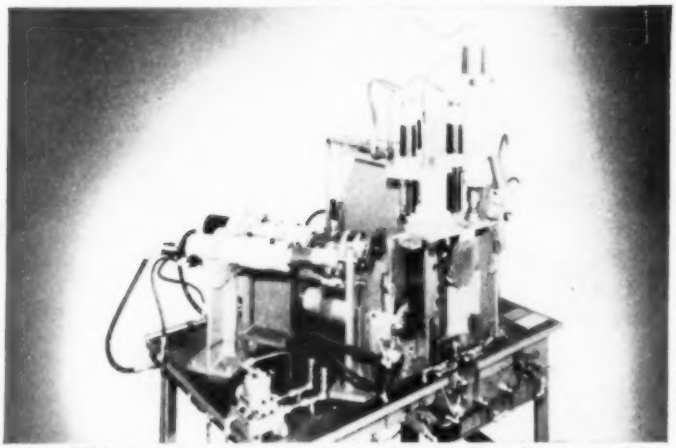
**COMPONENTS**
***You do it!***




**YOU DO IT—using ARO components! That's the way the makers of Lionel trains automated drilling. They used ARO Bant-A-matics and accessories . . . installed by their own plant men.**

**OR**

**COMPLETE PACKAGE**
***ARO does it!***



**ARO DOES IT—furnishing the "complete package"—everything from engineering to installation. That's how ARO Automation solved this problem for a maker of automotive parts.**

**DRILL, TAP, FASTEN** *faster* **with**

# ARO

## AUTOMATION AIR TOOLS

Name your problem in drilling, tapping or fastening . . . ARO can show you a simple way to solve it and step up production!

SINGLE OR MULTIPLE SET-UPS . . . air operated units for widest range of applications. Choice of 4 sizes. Capacities up to ¾". Minimum center to center distance 1".

ARO offers as much help as you need—from components to "complete package" including engineering, fixtures, accessories, automation tools and installation.

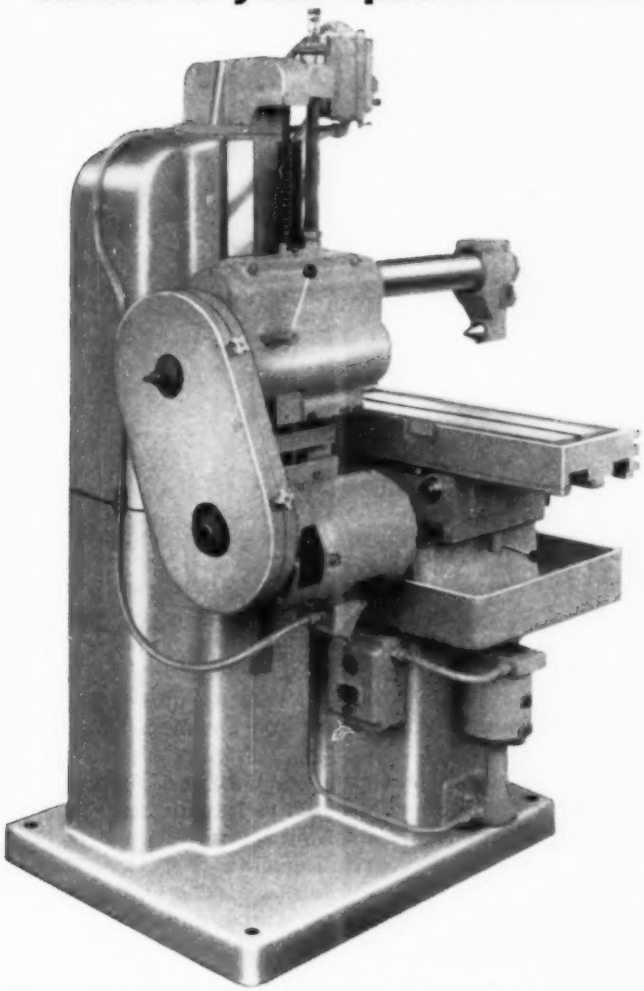
Let ARO Automation solve your problems in drilling, tapping, fastening. WRITE or call Aro for the help you need—or contact your Aro Field Representative.

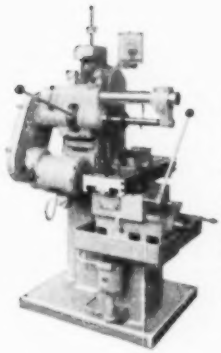
**THE ARO EQUIPMENT CORPORATION**
**Bryan, Ohio**
Aro of Calif., 3141 S. Grand Ave., Los Angeles 7, Calif.
Aro Equipment of Canada, Ltd., Toronto 15, Ontario
Offices in All Principal Cities

**ARO** ® **AIR TOOLS**
Also Portable Air Tools...
Air Hoists...Air Motors

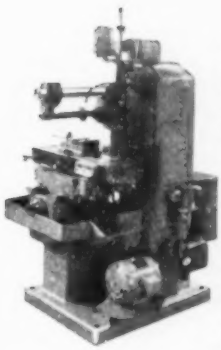
# A NEW HEAVY-DUTY BED MILLER

## with 3 standard arrangements suited to your specific needs

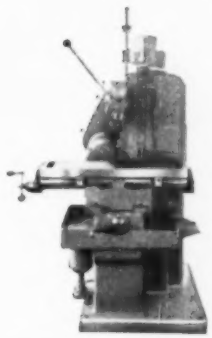




**MODEL 1A**
for economy on small lot production work. Table work surface 9-13 16" x 27", single T-slot, lever feed. Micrometer table stops, micrometer cross adjustment of saddle.



**MODEL 1B**
with Hydraulic Feed, for longer production runs. Two milling tables available: 9-13 16" x 27" (single T- slot), hydraulic lever control for rapid approach, feed and return; and 9-13 16" x 32" (3 T-slots), electrical push-button control for rapid approach, feed and return (automatic).



**MODEL 1C**
for low production and toolroom work. Large table work surface, 9-13 16" x 32", 3 T-slots. Handwheel screw feed, extra-large micrometer dial.

**Rugged, oversize, extra-heavy components throughout**

- Unit construction for flexibility
- Extra-wide table for easy mounting of large fixtures (two table lengths avail.)
- Tooth-belt spindle drive for full h.p. transmission
- Heavy-duty saddle
- Heavy-duty steel base
- Push-pull selector switch
- Extra long ways provide exceptional milling head rigidity
- Solid, extra-large (3" dia.) overarm and arbor support
- Hardened and ground box type table ways
- Micrometer adjustments, vertical, horizontal, transverse
- Six spindle speeds in two ranges: 111 to 1105 rpm and 247 to 2463 rpm
- 1 HP geared head motor (or 1½ HP)

**SEND FOR DETAILED FREE BULLETIN.** Your inquiry into the use of this versatile machine for your needs will receive prompt attention.
THE PRODUCTO MACHINE COMPANY, BRIDGEPORT 1, CONNECTICUT.

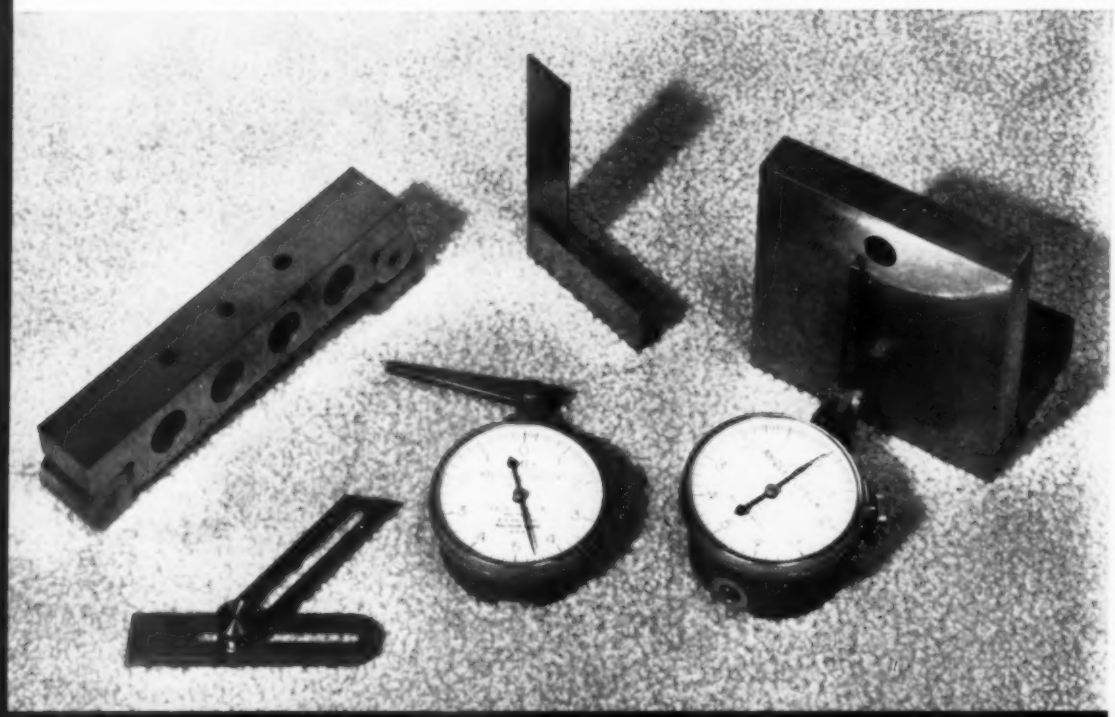
## PRODUCE MORE WITH

**PRODUCTO**

## MACHINE TOOLS

BED MILLERS, ROTARY AND LINE TRANSFER MACHINES,
AUTOMATIC INDEX PRODUCTION MILLERS,
SPECIAL MILLING MACHINES

*Check Angles Quickly and Precisely with the New*



# AMES DIAL TYPE ANGLE CHECK®

ANGLE CHECK, a new dial type measuring instrument, offers you a fast, inexpensive and extremely accurate method for checking all types of angular parts.

ANGLE CHECK is available in two models: Model V for vertical work and Model H for horizontal. Either model will accommodate any AMES 200 Series back. Contact blades can be specified in various shapes and lengths to meet your exact requirements.

Built to give long, trouble-free service, ANGLE CHECK will save hours in checking predetermined angles on simple and intricate shapes. Set ANGLE CHECK to master, protractor or sine bar.

The contact blade can be set simply and quickly without tools to a predetermined angle with the dial "0" under the indicator hand. A range of 10° – from 5° minus to 5° plus – in increments of 5′ can be obtained. ANGLE CHECK is accurate to 5′. Write today for complete information.

*Representatives in Principal Cities*

## B.C. AMES CO.

*26 Ames Street, Waltham 54, Mass.*

*Canadian Office — B. C. Ames Co., 45 Oriole Parkway, Toronto*

MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAUGES

Lincoln

# WELDYNAMICS

NEWS ABOUT ARC WELDING AT WORK CUTTING COSTS

*Sixteen 50-foot coach frames are assembled, welded and painted on this jig in one day.*

## SWITCHES ELECTRODE . . . SAVES $8,000

Guerdon Industries, Inc. of Newton, Kansas, builders of "Great Lakes" mobile homes, have doubled welding speed on undercarriages by a seemingly simple switch of electrodes.

Actually, the change was made as a result of a painstaking study by Ken Rymer, Guerdon's Welding Foreman; James Mandrut, Plant Superintendent and Bob Clemens, Lincoln's welding engineer in the area.

The frames consist of 13 gauge formed cross members welded in a jig to 12 gauge channels which form the longitudinal members. Length varies from 14 to 50 feet. Welds are made in vertical down and flat position and are of short duration thus requiring good restrike characteristics. The electrode also must combat light scale and oil.

Tests proved that Fleetweld 37, Lincoln's E-6013 electrode at 250 amps was twice as fast as the E-6010 rod previously used. Also cleaning time was greatly reduced because Fleetweld 37 has very little spatter.

At the present time, Guerdon's Newton plant turns out 16, fifty foot frames a day on one jig. Savings are averaging over $8,000 per year over the previous method.

*Fleetweld 37 electrodes are ideal for short, high speed welds. Light rust and oil are no problem.*

Mr. Mandrut states, "We look on Bob Clemens as our own welding engineer. He's always ready to tackle and solve our welding problems."

For help with procedures and cost reduction ideas, call your Lincoln welding engineer today.

*Guerdon's Jim Mandrut, "Lincoln engineering service is outstanding."*

## WELDIRECTORY AIDS ELECTRODE SELECTION

Matching the electrode to the job for the most efficient welding is greatly simplified by the new Weldirectory of Mild Steel Electrodes.

Electrodes are grouped according to performance characteristics, and each electrode is discussed individually so that the user can determine exactly which electrode best suits his purpose.

A copy may be obtained by writing to The Lincoln Electric Co., and requesting Bulletin 7000.1.

**THE LINCOLN ELECTRIC COMPANY**

**Dept. 2032 • Cleveland 17, Ohio**

*The World's Largest Manufacturer of Arc Welding Equipment*



CIRCLE 400 READER SERVICE CARD 

# Val Koller tells why he continually adds more Moore Jig Borers and Jig Grinders to his team

This is another in a series featuring the views of owners of leading tool and die companies.

by **VAL KOLLER**
President
Koller Die & Tool Co.,
Milwaukee, Wisconsin
Manufacturer of Dies
and Metal Stampings—
Tools—Jigs—
Fixtures and Gages—
Special Machines

Moore equipment in Koller plant, with new #3 Jig Grinder in foreground.

"Since our foundation in 1919 it has been my personal objective to strive for perfection. Since that time perfection has evolved into a .000010" word for tool and die makers. Such precision is rapidly becoming common-place...particularly in electronics and guided missile fields of production. With the installation of Moore equipment in 1950, we have been able to compete successfully in a caliber of work that before was not possible.

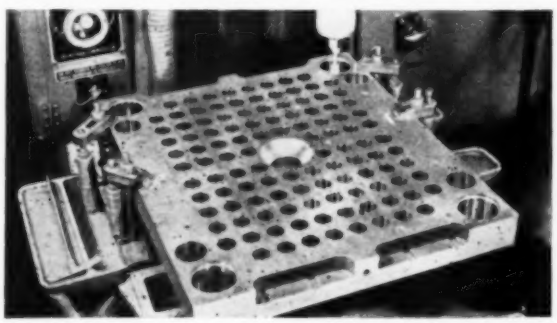
"Since that initial investment in a Moore Jig Grinder we have continually added Moore teammates to our toolroom. Today we operate more Moore equipment than any other top contract shop in the greater Milwaukee area.

"The tolerances and intricate contours now required make Moore Jig Borers and Jig Grinders a must in each toolroom. These machines operate at full capacity each workday with negative downtime due to mechanical failures. In fact, we have found that it costs real dollars and cents to operate *without* Moore equipment.

"This cost factor is just one of many reasons why we recently added another teammate to our toolroom ...the new Moore Model #3 Jig Grinder. This machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better."

Write today for literature describing the unique features of #3 Moore Jig Borers and Jig Grinders or see our catalog in SWEET'S MACHINE TOOL FILE.

**MOORE SPECIAL TOOL COMPANY, INC.**
738 Union Avenue, Bridgeport, Connecticut



This 116 cavity mold plate was completely jig ground at Koller on a Moore Jig Grinder. Tolerances: hole location ± .0001", hole diameter ± .0001".

HOLES, CONTOURS AND SURFACES, tells how to produce tools and dies *the modern way*. 424 pages, 495 illustrations. $5 in U.S.A. $6 elsewhere.

**ADD MOORE TOOLS TO YOUR TOOLROOM**

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

*Photos courtesy of The Universal Steel Company*

To cut inventory costs, make your Youngstown Warehouser your local "steel service center". Make full use of his complete local stocks, fast delivery service. His one-source service simplifies your purchasing and bookkeeping, too. You'll find him an efficient, time-saving, partner-in-production.

AMERICAN STEEL WAREHOUSE ASS'N

THE
**YOUNGSTOWN**
SHEET AND TUBE COMPANY
*Youngstown, Ohio*

*Manufacturers of Carbon, Alloy and Yoloy Steel*

CIRCLE 402 READER SERVICE CARD

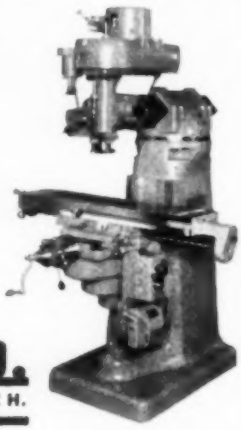
*A Lot More*
**POWER**
*A Lot More*
**ACCURACY**
***ECONOMY too!***

**INDEX "SUPER 55" VERTICAL MILL**

● 1½ HP Head or optional 2 HP with continuous duty motor gives 50% or more capacity . . . More rigidity, more accuracy . . . Increased horse power and dynamically balanced Cast Iron Pulleys and Drive System afford improved production capacity . . . More weight in the column, heavier ribbed column, heavier knee, heavier saddle.

**INDEX "45" VERTICAL MILL**

● Unique square design of overarm affords more rigidity, greater accuracy . . . Provides extra range and capacity . . . More power at the cutter. No adjustment required on overarm and head after use . . . No need to re-indicate head after moving overarm . . . Speed range with nine changes makes possible the use of high speed or carbide tipped cutters to best advantage.



**INDEX MACHINE CO.**
547 N. MECHANIC ST., JACKSON, MICH.

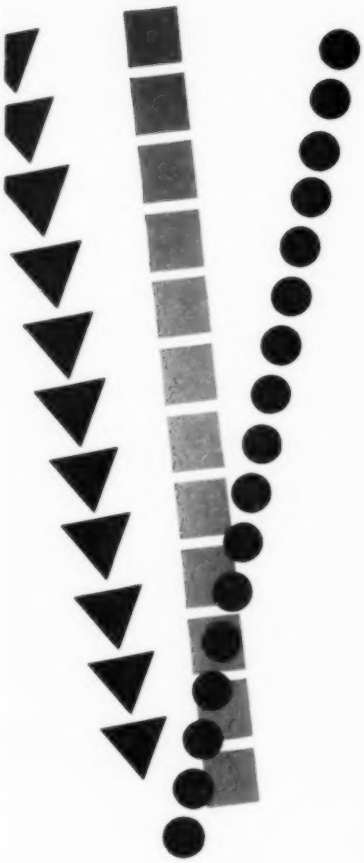
CIRCLE 403 READER SERVICE CARD

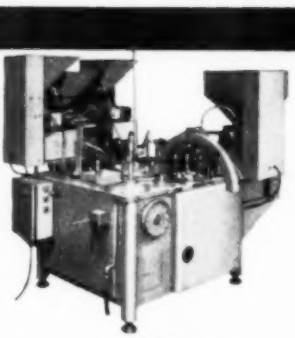
# WORTH MONEY

Most people like to compare their own performance with the championship record. Sometimes you feel better, sometimes worse. But at least the comparison tells how you are doing.

This is the kind of comparison you can make for your production equipment with the **American Machinist Inventory of Metalworking Equipment.** Listed in 96 pages are 167 types of equipment, 16 major industrial groups, 25 geographical areas.

Compare your plant with competition, with local plants, with the nation as a whole. A copy of the Inventory costs but $2.00 and may be secured by writing Reader Service Department, American Machinist, 330 West 42nd Street, New York 36, N. Y.





**NEW V & O MACHINE**
for small parts assembly

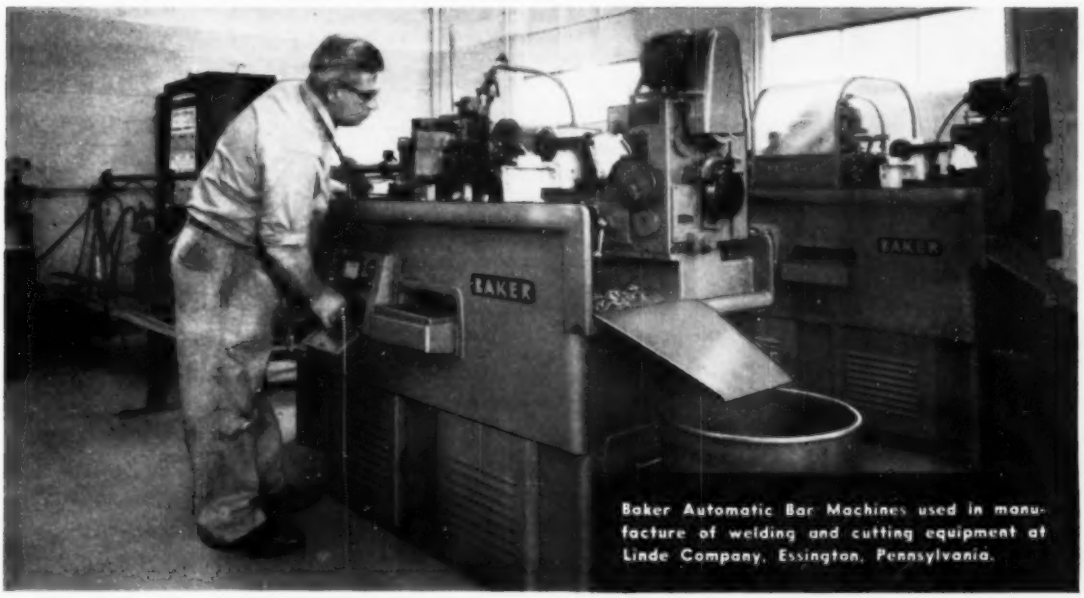
offers a basic operating principle almost endless in its applicability to cost reduction.

Emhart Manufacturing Co.
Hudson, New York
V & O Presses and Feeds

CIRCLE 405 READER SERVICE CARD

# Linde Company reports:

# 100%-600% PRODUCTION GAIN



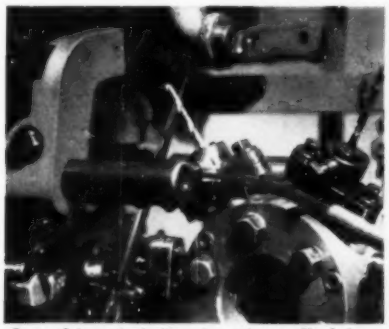

Baker Automatic Bar Machines used in manufacture of welding and cutting equipment at Linde Company, Essington, Pennsylvania.

# AND 75% LOWER LABOR COSTS

Until two years ago, the Linde Company used manual turning machines which required an operator for each unit. Then, this manufacturer of welding equipment installed two BAKER AUTOMATIC BAR MACHINES, both of which are controlled by one operator.

Says Henry S. Minka, Linde production supervisor, "The versatile and efficient BAKER machines have increased man-hour production 100% to 600%; have cut labor costs 75%; turning machine rejects are reduced substantially; and the size range of parts handled by these units has been increased." Mr. Minka also reports, "The most important advantage of the BAKER AUTOMATIC BAR MACHINES is the improvement in production speeds." An infinitely variable speed selector offers a range of from 0 to 7200 rpm, forward or reverse. As a result, left-handed tools are unnecessary and there is no need to make or adjust cams for special speeds.

For full information on BAKER AUTOMATIC BAR MACHINES, write BAKER BROTHERS, INC., Dept. AB-559, 1000 POST STREET, TOLEDO 10, OHIO.



One of two 6-station turrets, easily interchanged by removing 3 cap screws. Turrets handle ¾" and 1" diameter shanks.

BAKER®

AUTOMATIC

BAR MACHINES

STANDARD AND SPECIAL DRILLING AND TAPPING MACHINES • COMPRESSION MOLDING MACHINES

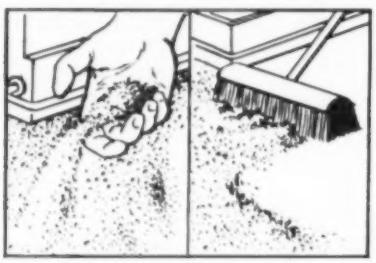
Send **TODAY**

# FREE SAMPLE FLORCO

*the amazing adsorbent of oils and greases!*

**ECONOMICAL, TOO!**

Keeps floors **Safe** and **Clean**



1.—Sprinkle Florco on Oil & Grease Disappear like Magic! 2.—Sweep it up

**Floridin Company**
P. O. Box 989, Dept. V
Tallahassee, Florida

O.K. I'll try Florco on my floor.
Send me, without cost or obligation, my free sample.

Name _____ Title _____
Address _____
City _____ Zone _____ State _____
Type of Business _____

298 CIRCLE 407 READER SERVICE CARD

# One of these Wilson "Rockwell" instruments will do your hardness testing job

No matter what your hardness testing requirements are, there's a Wilson "Rockwell" tester to do the job. Choose from this complete selection of hardness testing equipment:

**"Rockwell" Hardness Tester**—for most hardness testing functions.

**"Rockwell" Superficial Tester**—for extremely shallow indentations.

**TwinTester**—Combines functions of "Rockwell" and "Rockwell" Superficial testers.

**Semi and Fully Automatic**—for high-speed testing, at rates up to 1,000 pieces per hour. Automatically classifies pieces as CORRECT, TOO HARD, or TOO SOFT.

**Special Machines**—for testing large objects, internal readings, and other unusual applications.

**Diamond "Brale" Penetrators**—Flawless diamonds, individually calibrated, and highest quality construction assure perfect testing every time.

*Write* for **Bulletin RT-58**

# WILSON "ROCKWELL" HARDNESS TESTERS

ACCO

**Wilson Mechanical Instrument Division**
**American Chain & Cable Company, Inc.**
230-B Park Avenue, New York 17, New York

CIRCLE 408 READER SERVICE CARD

# NUTAP

## Automatic NUT TAPPER

Taps nuts and screw machine parts automatically to close tolerances. Produces smooth, clean threads square to nut bearing surface. Maintains high production with minimum tapwear. Safety devices prevent tap breakage. Complete information available on request.

**NUTAP** *also manufactures*
**NUT FACERS**
**NUT BURNISHING PRESSES**
**NUT COUNTERSINKING PRESSES**
**C. P. NUT PRESSES**

*General Representative in U. S. A. and Canada*

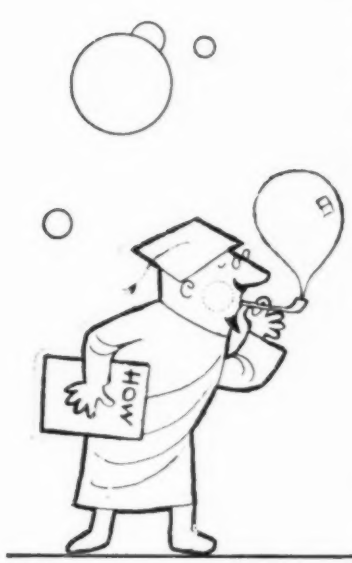
**ERICH LANGE ENGINEERING**
**1137 Cranford Avenue • Cleveland 7, Ohio**

CIRCLE 409 READER SERVICE CARD

# NEW SERIES IR DRILLS...

**NEW designs NEW speeds NEW power to give you an**

# ANNUAL DIVIDEND on your PAYROLL DOLLARS




If your operators are using older model drills, you can increase their man-hour productivity by as much as $2220 Payroll Dollars in one year, just by replacing the older tools with these new, more efficient I-R tools.

Multiply these *Annual Dividends* by the number of drill operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of *Dividend on Payroll Dollars* these new I-R drills can help you earn in just one year—without adding to your present payroll.

It's yours without obligation. To get it, call your I-R AIRengineer today. Or write Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Ingersoll-Rand

*Tools plus AIRengineering increase output per man*

8-924

## Hardness testing made *Easy!*

**Save Time!**
**Test Accurately!**

*Ames* PORTABLE
## HARDNESS TESTERS

Frequent hardness testing of metals before and during fabrication and after heat treating is essential today for best results.

Ames Portable Hardness Testers answer the need for a light weight, accurate, dependable tester that may be carried to the work for on-the-job testing. They are easy to use, require no skill, and get speedy, accurate tests wherever the work may be—no delays, no cutting off specimens—no waiting for laboratory tests.

Besides testing flats, rounds, tubing, etc. Ames Hardness Testers make tests that otherwise would be impossible, such as large gears, knives, saws, blades, struts, frames and assembled parts. Thousands are in use paying for themselves over and over again in time and materials saved.

*Send for free bulletin*

**AMES PRECISION MACHINE WORKS**

Waltham 54, Massachusetts

CIRCLE 411 READER SERVICE CARD

## *PERFORMANCE ASSURED!*

Clay-extrusion machinery will operate more efficiently thanks to these precision-built steel spur gears. Stahl met the specifications EXACTLY—38" O.D., 9" F., 24" Bore, 36 T., 1 D.P.—14" O.D., 9" F., 6" Bore, 12 T., 1 D.P. Teeth flame-hardened for long life. YOUR specifications will be equally meticulously met. Stahl's estimate will be convincing. Send for it today.

SPURS TO 72" PD. 1 DP
BEVELS TO 54" PD. 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD. 2 DP
CONTINUOUS TOOTH HERRINGBONE TO 60" PD. 2 DP
SPROCKETS TO 72" PD. 2½" CP
RACKS TO 20 FT. LONG. 3 DP
SILENT GEARS, RAWHIDE, BAKELITE, FIBROIL
HEAT TREATED, CASE OR FLAME HARDENED GEARS—OF CARBON OR ALLOY STEEL

## *Stahl*

**GEAR & MACHINE COMPANY**

3901 HAMILTON AVENUE
CLEVELAND 14, OHIO

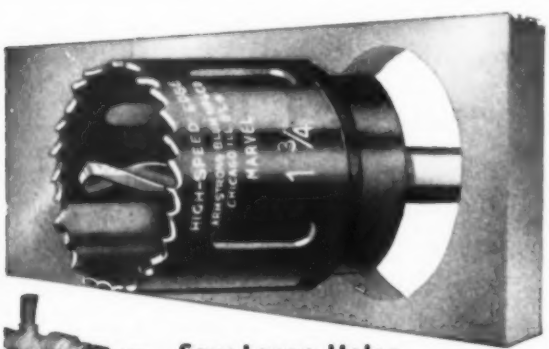
CIRCLE 413 READER SERVICE CARD

Write for list of Special Reports currently available from

**Reader Service Department**

**American Machinist**

McGraw-Hill Bldg., New York 36, N. Y.



## Saw Large Holes thru sheet or plate

**MARVEL High-Speed-Edge Hole Saws (with high-speed-steel cutting edge integrally welded to tough alloy steel body) provide fast, economical means of sawing out holes from 9/16" to 6" diameter through steel up to 1 1/8" thickness. Extra cutting quality and high-speed-steel, self-aligning, double drive pin arbors give strength for use on drill presses, lathes and portable tools, greatly increase the hole size capacity of small tools. Last longer and cut faster with safety.**

*Write for Hole Saw Catalog Sheets.*

*Metal Cutting*
**MARVEL SAWS**
Better Machines—Better Work

**ARMSTRONG-BLUM MFG. CO.**

*"The Hack Saw People"*

5700 Bloomingdale Ave. Chicago 39, U. S. A.

## NEW EXPANDING COLLET pat. pend.

Inside chucking to .0005 T.I.R.
5C, 4C, 3C, 3AT, J sizes in stock.
Sizes from 3/16" to 6" dia.
Order 5C size complete $15.95.
Machinable from 1 5/8" to 3 3/8" dia.

**THE DUNHAM TOOL CO., INC., Danbury 4, Conn.**

CIRCLE 415 READER SERVICE CARD

## GRANT

RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

*Write for literature and don't forget to send samples.*

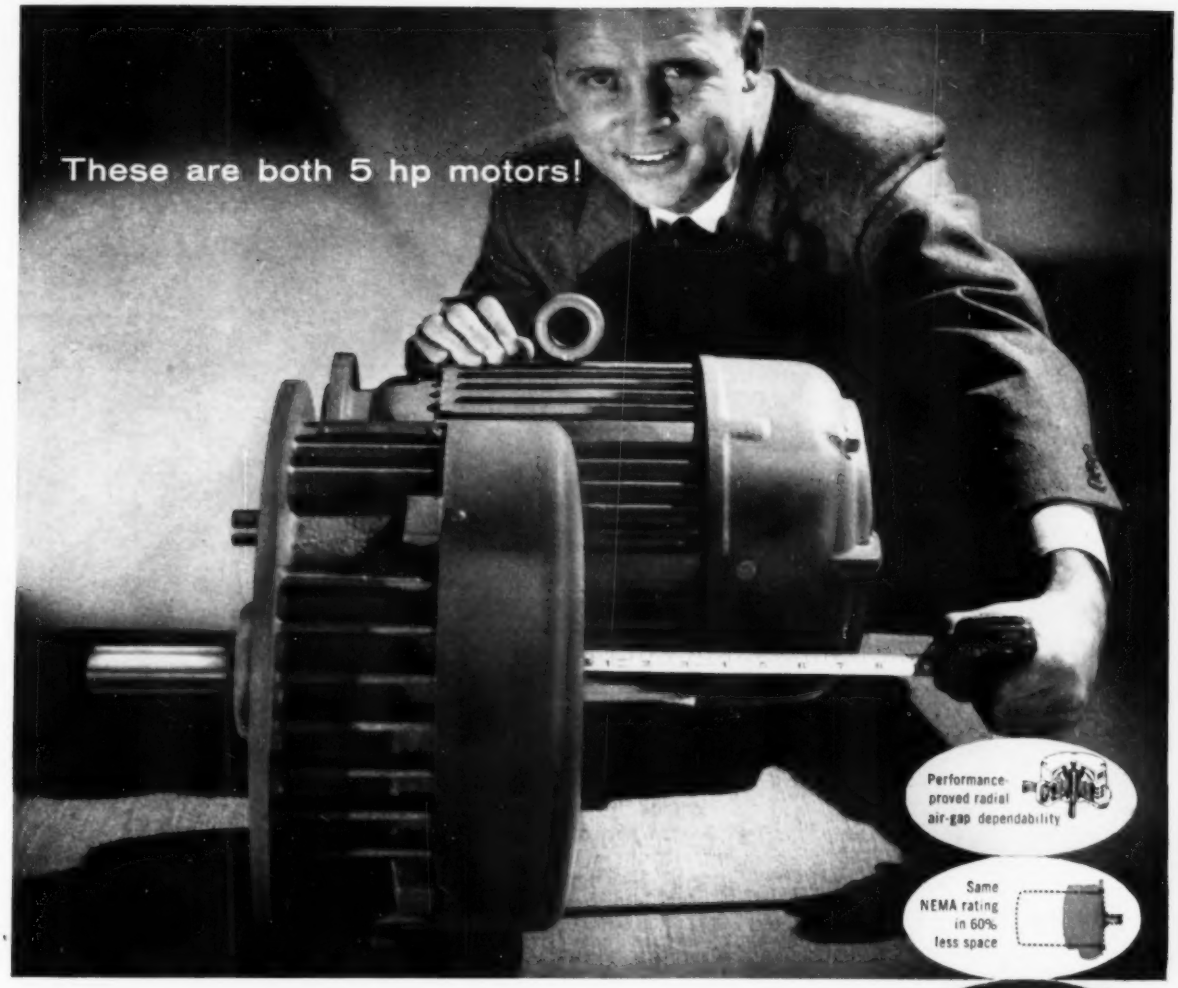
THE GRANT MFG. & MACHINE CO.

85 Stillman Ave., Bridgeport, Conn., U. S. A.



CIRCLE 412 READER SERVICE CARD

CIRCLE 416 READER SERVICE CARD




# 60% shorter— but with radial air-gap design!

## New Louis Allis Pancake Motor preserves all the advantages of conventional motor construction

The new Louis Allis Pancake Motor is your solution to trouble-free power in any space-cramped motor application.

The Pancake is a remarkably short flange-mounted motor — up to 60% shorter and 33% lighter than standard motors of the same rating! And it is built in *conventional* radial air-gap design!

It's done by an ingenious forming process which literally compresses the end coils of a conventional radial air-gap motor into an exceptionally short length. The result is a compact, light motor ideally suited for horizontal or vertical mounting on machine tools, roof ventilating fans, or *any* close-quarter installation where space is a critical design factor.

What's more, this is achieved without sacrificing a single desirable characteristic: the stator still contains the same iron and copper as standard Louis Allis motors . . . standard NEMA service factor is maintained . . . high insulative values are retained by using proved Louis Allis varnishes and new insulating techniques . . . over-sized pre-lubricated bearings are used to guarantee long bearing life . . . and the entire motor is enclosed in an industrial-type cast-iron housing designed to shrug off abuse!

The housing and flange are cast in one piece: this permits extra-accurate internal machining which extends bearing life and reduces noise levels to a new low.

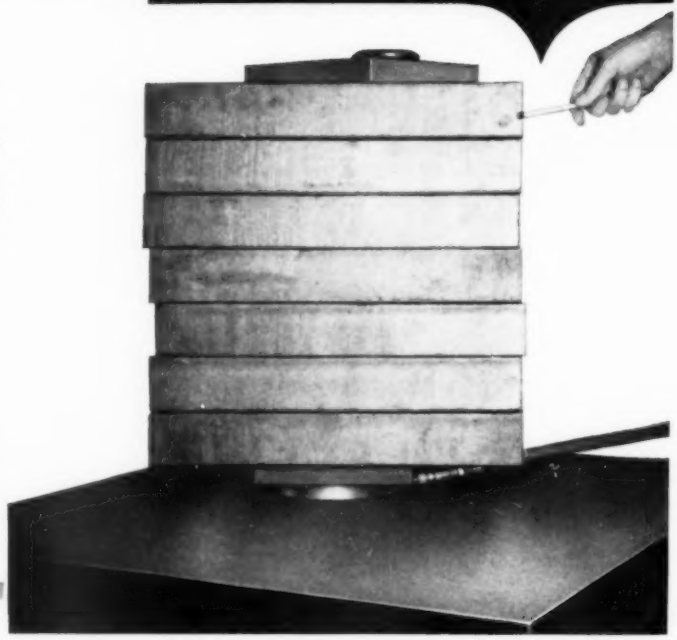
Investigate the Pancake Motor through your local Louis Allis District Office. Sized from 1 to 15 hp, at 1800, 1200, and 900 rpm, in open drip-proof and enclosed non-ventilated or fan-cooled enclosures. Write for Bulletins 2100 and 2150 to the Louis Allis Co., 452 E. Stewart St., Milwaukee 1, Wis.

AM-101

**LOUIS ALLIS**

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

## *"I positioned ONE ton with a PENCIL - Twenty One Tons with One HAND"*



Friction free, supported on a film of air (normal Shop line pressure or less), a Union Jato Airborne Fixture enables heavy loads to be rotated or positioned with practically no effort.

Standard rotary and transport tables are available for loads to 50,000#. Heavier loads can be supported by combinations of tables.

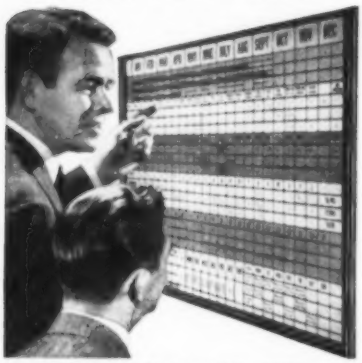
Check your special requirements through your Industrial Distributor or write us for Bulletin JTO-9-58.

**UNION MANUFACTURING DIVISION**
UNION MANUFACTURING COMPANY
280 CHURCH STREET, NEW BRITAIN, CONN.
*Makers of Union Chucks and Die Sets*

UNION MFG. CO. NEW BRITAIN, CONN. U.S.A.

CIRCLE 418 READER SERVICE CARD

## How To Get Things Done Better And Faster



**BOARDMASTER VISUAL CONTROL**

- Gives Graphic Picture — Saves Time, Saves Money, Prevents Errors
- Simple to operate — Type or Write on Cards, Snap in Grooves
- Ideal for Production, Traffic, Inventory, Scheduling, Sales, Etc.
- Made of Metal Compact and Attractive. Over 350,000 in Use

Full price **$49.50** with cards

**FREE** 24-PAGE BOOKLET NO. JB-30 Without Obligation

Write for Your Copy Today

**GRAPHIC SYSTEMS**
55 West 42nd Street • New York 36, N. Y.

## The production man's guide to

# Fastening Devices

**Knowing how to put a product together is one of the keys to efficient production. Quick, inexpensive machining and forming techniques are wasted if slow, cumbersome and inefficient assembly methods are used. This Special Report summarizing typical mechanical fastening devices will help you select a fastener that will lead to a more dependable, more economical product.**

*16 pages, fully illustrated — 35 cents per copy*

*Reader Service Department*

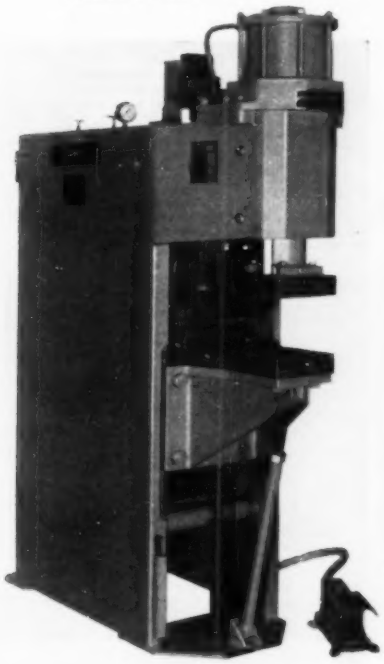
**American Machinist**

**McGraw-Hill Building** **New York 36, N. Y.**

*Introducing...*

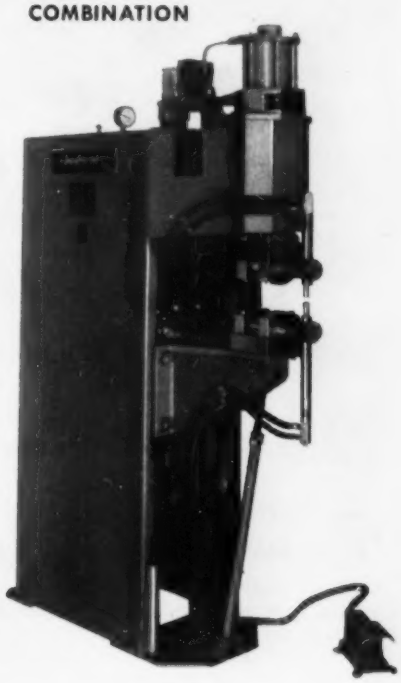
# FEDERAL'S NEW TRIM-LINE PRESS WELDERS

PROJECTION



SPOT

COMBINATION



## *Available from stock in four sizes in capacities of 30 to 500 K.V.A.*

Completely new . . . these advanced design trim-line press welders will give you maximum production in a minimum floor area. What's more their compact, simplified design assures easier operation, less maintenance and ready accessibility.

Designed and built by Federal, one of the largest and most experienced resistance welder manufacturers, these new welders are available from stock as spot welders with horns, projection welders with platens, or combination spot and projection welders. Each type is available in a full range of standard throat depths, welding forces and transformer sizes.

Many standard automatic welding attachments are available to increase production with these standard machines.

Listed below are some of the features. For more information get in touch with the Federal representative nearest you. Ask for Bulletin P-59 and Special Tooling Bulletin AWA-59.

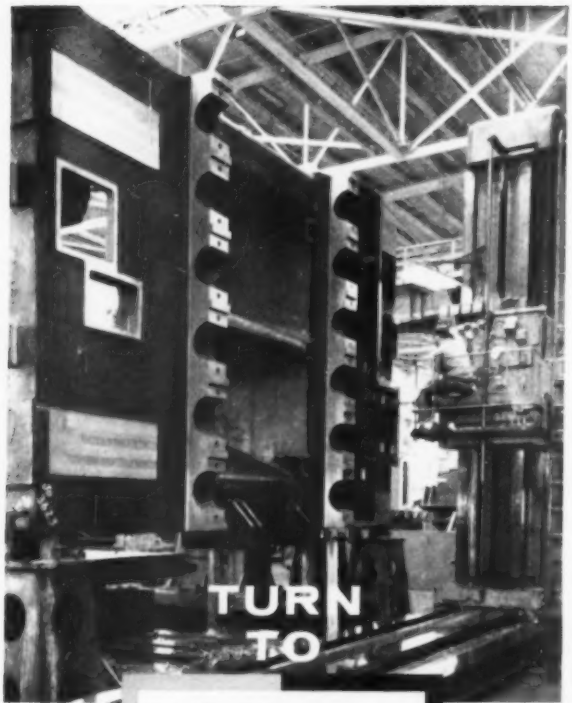
**COMPLETELY ALL NEW DESIGN FEATURING:**

- **New One Piece Frame** . . . stronger, less floor area, greater accessibility.
- **New Anti-Friction Slide** . . . hardened and ground slideweighs —eight anti-friction roller mount gives maximum stability —permanently lubricated rollers—simple adjustment.
- **New Steel and Copper Lower Arm** . . . minimum deflection—easier to adapt for special tooling.
- **Stock Models** . . . all components built for stock, quick delivery.
- **No Price Increase** . . . superior design at low cost.

**Federal / Warco**

**THE FEDERAL MACHINE AND WELDER CO. • WARREN, OHIO**

AFFILIATED WITH BERKELEY-DAVIS, INC., DANVILLE, ILLINOIS, MANUFACTURERS OF AUTOMATIC ARC WELDING EQUIPMENT




## . . . for machining jobs too big for your tools

If the capacity of your machines is inadequate for the jobs you have on hand, you can expand your facilities without capital investment through the use of Verson's Contract Machining Division. Verson is completely equipped with huge milling, boring and drilling machines, lathes and planers. Here, industry's most modern facilities can function as a part of your own.

Verson is also equipped to handle steel plate fabrication, large weldments and medium and large size gear cutting jobs . . . on a contract basis. For quotations, just send an outline of your needs. Whatever your requirements, it will pay you to talk to Verson first. There is no obligation, of course.

**GET THE COMPLETE VERSON STORY**

Bulletin F-57 illustrates and describes industry's most modern facilities . . . for contract weldments . . . machining . . . gear cutting (herringbone and spur) . . . press rebuilding. Write for your copy today.

218

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

Verson

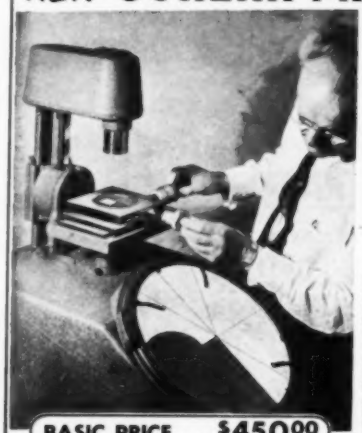
**VERSON ALLSTEEL PRESS CO.**

9316 S. Kenwood Avenue, Chicago 19, Illinois
8300 S. Central Expressway, Dallas, Texas

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES
TRANSMAT PRESSES • TOOLING
DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

## INSPECTION BY PROJECTION

with the *NEW* **SCHERR MICRO PROJECTOR** with the **VERTICAL DESIGN**



**NEW IMPROVED *Self-Contained* MODEL**

featuring

Rigid Floor Base — eliminating extra charge for table
Tilting Stage for Helix, Angles and Bevels
4" Dia. Stage Opening
14" Diameter Screen
Column Slide adjustable for wear by means of gibs. Will hold square indefinitely.
Custom made Precision Coated Lenses and double condensers for different objectives 10 to 100X magnification.
Surface Illuminator can be added anytime.
An entirely new practical designed tool for Inspection Department and Production Shop.

*WRITE FOR ILLUSTRATED FOLDER CODE GIUJY*

**BASIC PRICE . . . $450.00**

SCHERR PRECISION COMPARATOR CHARTS

OVERLAY and REPLACEMENT STANDARD CHARTS are carried in stock.

SPECIAL CHARTS made up to your specifications.

**GEORGE SCHERR CO., Inc.**
COMPLETE LINE OF PRECISION INSTRUMENTS

WEST COAST BRANCH: SCHERR-TUMICO CO. - 3337 W. Olympic Blvd. - Los Angeles 19, Cal.
200 AM LAFAYETTE STREET • NEW YORK 12, N. Y.

CIRCLE 423 READER SERVICE CARD

**A SPECIALIZED CAM MILLING SERVICE**
**Over 100 Types of INDEXING TURNTABLES**

*Also Geneva Gears, Spot and Butt Welding, Positioners for Brazing, Spraying, Welding and Soldering*

CAMS OF ALL TYPES

*Dr. Chas. Eisler ME, Founder*
*Chas. Eisler, Jr., Pres.*

*Cam Calculating Service*

Contract production; Special automatic machines

**EISLER ENGINEERING CO., INC.** | 750 SOUTH 13TH STREET NEWARK 3, N. J.

CIRCLE 424 READER SERVICE CARD

## DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

*Write for sample on company letterhead*

**THE DYKEM COMPANY**
2301B North 11th St. • St. Louis 6, Mo.

## CUT SCRAPER TIME

**END NIGHT CLEANUP & MORNING REBLUING**

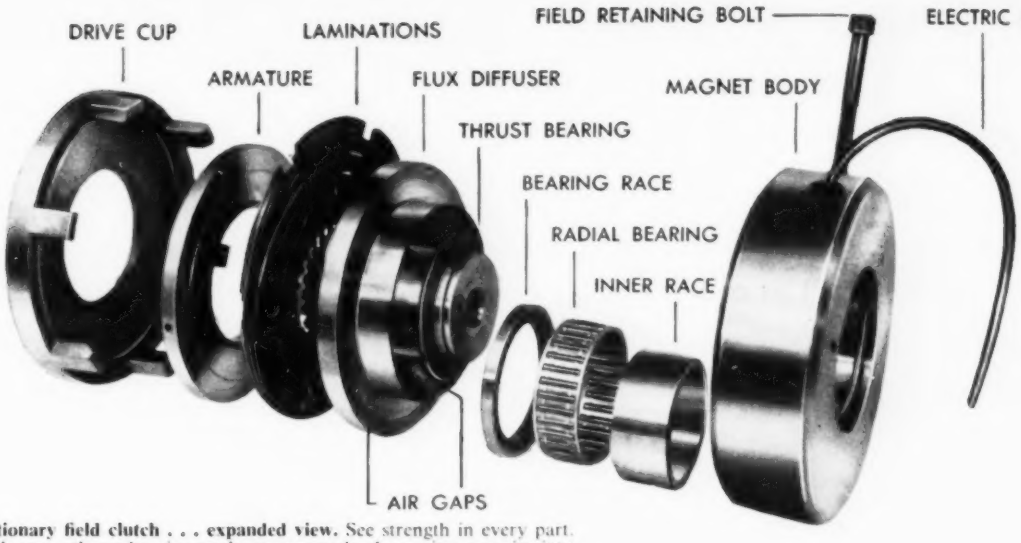
**DYKEM HI-SPOT BLUE No. 107** is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

**THE DYKEM CO., 2301B NORTH 11TH ST., ST. LOUIS 6, MO.**

CIRCLE 425 READER SERVICE CARD



CIRCLE 422 READER SERVICE CARD




**Stationary field clutch . . . expanded view.** See strength in every part. Roller-type thrust bearing packs enormous load-carrying capacity into small space. It is a type proved in automotive transmissions for years.

# DURABILITY

The *durability* of I-T-E Electro-Clutches is one of the big reasons for making them your choice. Bearing life is equal to machine life. Each design of clutch is operated 100,000 times before torque rating is determined. After that, it is required to run several hundred thousand additional operations without loss of torque or need for maintenance of any kind. Nothing matches them.

### FAST, FIRM CLUTCHING

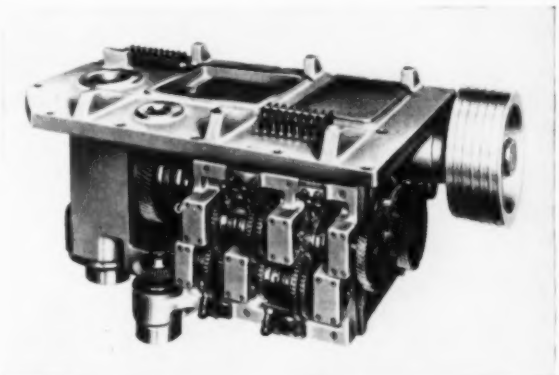
Clutching action takes place between interleaved laminations of *hardened steel* . . . not friction material or sintered nonferrous metals. The clutch lasts as long as the machine. No other clutch on the market offers such durability. In addition, because it has a fixed air gap, there are never any adjustments or loss of performance with age.

### NEW MODEL NEVER NEEDS UPKEEP

Recently I-T-E introduced the *stationary field* Electro-Clutch that does away with the slipring and brush. So there is never anything to service. And never anything to replace. This means that designers can bury the clutch deep inside a drive box or transmission . . . for access is never needed. For easy assembly, they slide right on the shafts as one unit.

### WIDE RANGE OF TYPES AND SIZES

I-T-E Electro-Clutches are available to fit your own shafts and in torque ratings from 3.2 to 13,000 lb-ft. Stock voltage ratings are 24 and 90 v d-c. Other control voltages provided on request. Write for complete details. I-T-E Circuit Breaker Company, 1900 Hamilton St., Philadelphia 30, Pa.



**They go inside with the gears and the oil.** This is the main transmission of a Fosdick Precision Jig Borer. You can scarcely see the 13 standard I-T-E Electro-Clutches. But they are there . . . mounted right on the same shafts with the gears. Because they operate in an oily atmosphere, they save transmission space and simplify design.

**I-T-E CIRCUIT BREAKER COMPANY**



CIRCLE 426 READER SERVICE CARD

# USE THIS NEW KIND OF DIAMOND CUT-OFF WHEEL

Gives narrower, smoother cuts on industry's toughest materials

**...yet prices start at only $32.25**

Now... at *production prices*... DIATRONIC gives you a rim width of .006" that's accurate to a maximum total tolerance of .0005"—or your money back. This accuracy is built in by a new process. No break-in needed. New narrow cut reduces sawdust loss 30%. A must for $3,000-a-pound silicon or germanium crystal. Cuts tungsten carbide, corundum, aluminum oxide, glass... practically anything. Stock orders shipped in hours; special wheels available. Write for literature, price list.

*Another invention marketed by*

**NAVAN PRODUCTS, INC.**

Subsidiary of North American Aviation, Inc.

**Dept. 122, International Airport, Los Angeles 45, Cal.**

**DIATRONIC* DIAMOND WHEELS**

"with built-in tolerance"

*TRADEMARK

CIRCLE 427 READER SERVICE CARD

## Fiske's Darl Base

A base cutting oil for use in working both ferrous and non-ferrous metals. Can be used straight or reduced with mineral oil to suit the metal and work. Non-corrosive. Permits visibility when mixed. Has exceptional anti-weld properties, lubricity and film strength. For better finish of product and longer tool and die life, use "DARL".

Bulletins describing Fiske's Darl Base Oil and other specialty lubricants and coolants sent on request.

FISKE'S *Since 1870*

**METAL WORKING LUBRICANTS**

**FISKE BROTHERS REFINING CO.**

129H LOCKWOOD STREET, NEWARK 5, N. J.

Plants: Newark 5, N. J. Toledo 5, Ohio

CIRCLE 428 READER SERVICE CARD

# A Grieder Tube Cut-Off Machine will produce 4500 to 6500 cut-offs per hour

Grieder Tube Cut-Off Machines are 3 to 8 times faster than others, and speed is only one of the cost saving advantages they provide. For example:

- $ Cut tubing of any shape to any length—steel, copper, brass, aluminum and alloys. Continuous automatic operation.
- $ Lengths can be held to plus or minus .002" on light wall tubing and to .003" on heavier.
- $ Precision clamping dies prevent tube distortion and produce a quality cut. Tube does not rotate.
- $ Thousands of cuts without grinding. Blades can be sharpened on standard tool room equipment and used for as many as a million cuts.

Write for literature, stating tube sizes and production requirements.

Grieder

TUBE CUT-OFF MACHINES

GRIEDER INDUSTRIES, INC.
P. O. Box 169 • Bowling Green, Ohio

Please send bulletin describing Grieder Tube Cut-Off Machines.

NAME_____

COMPANY_____

CITY_____ ZONE_____

STATE_____

# FIELD PROVEN...

## Honeywell Electro Hydraulic Tracer Systems

Now operating on a wide variety of well-known machine tools (some of them illustrated at the right), Honeywell 180° and 360° Tracer Control systems provide fast, accurate and reliable system response for smooth application of large increments of hydraulic power.

They combine the flexibility, remote control and finesse of electronics with the power and fast actuation of hydraulics. They're far more flexible than completely hydraulic systems. These systems have been designed for ease of application. Modular construction simplifies and speeds field service.

**Accuracy**—Accuracies of ± .0005" from template to part and ± .0002 from part to part have been achieved in actual use.

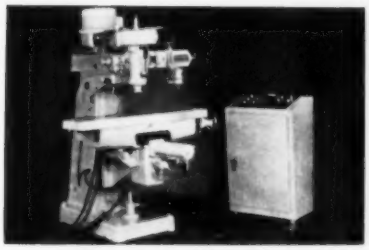
**Adaptability**—These systems are now in operation on all types of machine tools, from light duty engine lathes to huge spin forging machines. Every application is custom fitted—at production line prices.

**Performance**—Each Honeywell system becomes an integral part of the machine tool. The control system can be adjusted to compensate for changes in machine performance during the life of the machine. Speed range of 300 to 1 is normal; greater rangeability is available on some applications. Tracing speed ranges up to 60" per minute are available.

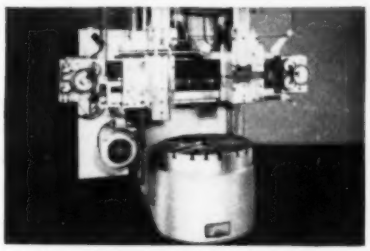
For further information on Honeywell's new machine control systems and components and their application to your specific job, contact Minneapolis-Honeywell, Machine Control Group, Dept. AM-5-93, Minneapolis 8, Minnesota.

**Honeywell**

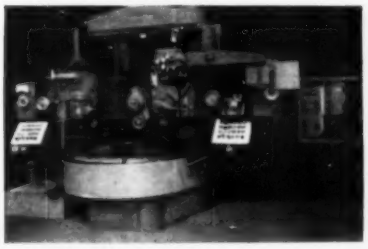
First in Control



Gorton Vertical Milling Machine equipped with Honeywell 360° Electro Hydraulic Tracer Control System.

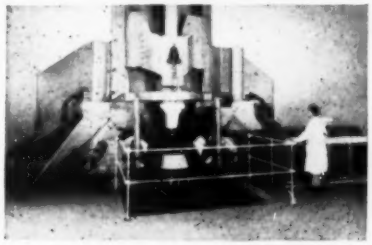


Giddings & Lewis vertical turret lathe with Honeywell 360° Electro Hydraulic Tracer Control System.



Frauenthal Division of Kaydon Engineering Corporation turning and grinding machine with Honeywell 180° Electro Hydraulic Tracer Control System.

Rockford Machine Tool Company hydraulic mill with Honeywell 180° Electro Hydraulic Tracer Control System. Swarfing operation.



Hufford Corporation spin forge machine with *two* Honeywell 360° Tracer Control Systems plus spindle speed control.



CIRCLE 430 READER SERVICE CARD 307

Only from

**WT** ALKER-URNER ...

# FULL 6" SPINDLE TRAVEL IN A LOW-COST 15" DRILL PRESS

Here's the biggest value in drill presses on the market—a rugged Walker-Turner "Light-Heavyweight" that offers big capacity formerly found only in larger, higher priced units. With one pass of the drill, it will machine holes in cast iron up to 6" deep and in diameters up to ½". In addition, it's capable of providing fast, accurate production drilling for years to come. Available in bench and floor single or multiple spindle production models.

For a demonstration, see your W-T Distributor (listed under "Tools" in your yellow pages).

*The Walker-Turner drill press line includes 15"—4¼" travel, 17"—5" travel, 20"—6" travel, and radial drill presses.*

**FREE CATALOG!**

Write to Walker-Turner Division, Rockwell Manufacturing Co., Dept. WE-21, 400 N. Lexington Ave., Pittsburgh 8, Pa.

15" Production Model

WALKER-TURNER
LIGHT-HEAVYWEIGHT MACHINE TOOLS
another fine product by
ROCKWELL

CIRCLE 431 READER SERVICE CARD

Want to know 116 different ways to join a piece of welded steel tubing to another tube or to other parts? Send for 16-page, illustrated special report from American Machinist:

**The Production Man's Guide to**

## JOINING WELDED STEEL TUBING

Send 35c for each copy wanted to:

*READER SERVICE DEPARTMENT*

**American Machinist**

**330 West 42nd Street, New York 36, N. Y.**

# let Ingersoll HYDROSPIN your parts

If the shape of your part is tubular, conical, hemispherical, or curvilinear, hydrospinning by the Ingersoll Kalamazoo Division may save you costly machining expense and time. If you want a seamless part, try hydrospinning. If you want precise wall thickness, turn to hydrospinning. Hydrospinning saves on metal, time and labor.

**COMPLETE PRODUCTION FACILITIES**

Ingersoll Kalamazoo Division has an experienced engineering staff, and complete hydrospinning equipment. If you have a metal forming problem where hydrospinning may be of help to you, send an outline of your problem or contact the Defense Sales Dept. of

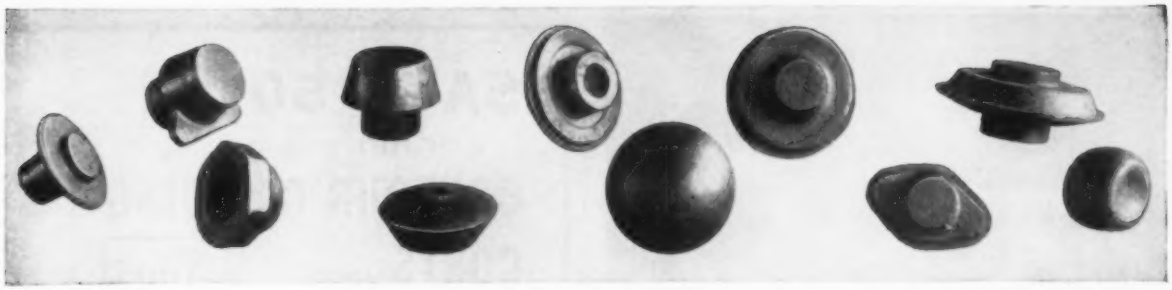
**Borg-Warner Corporation**

ENGINEERING
B-W
PRODUCTION

INGERSOLL KALAMAZOO DIVISION

1810 N. Pitcher St. • Kalamazoo, Michigan

CIRCLE 433 READER SERVICE CARD

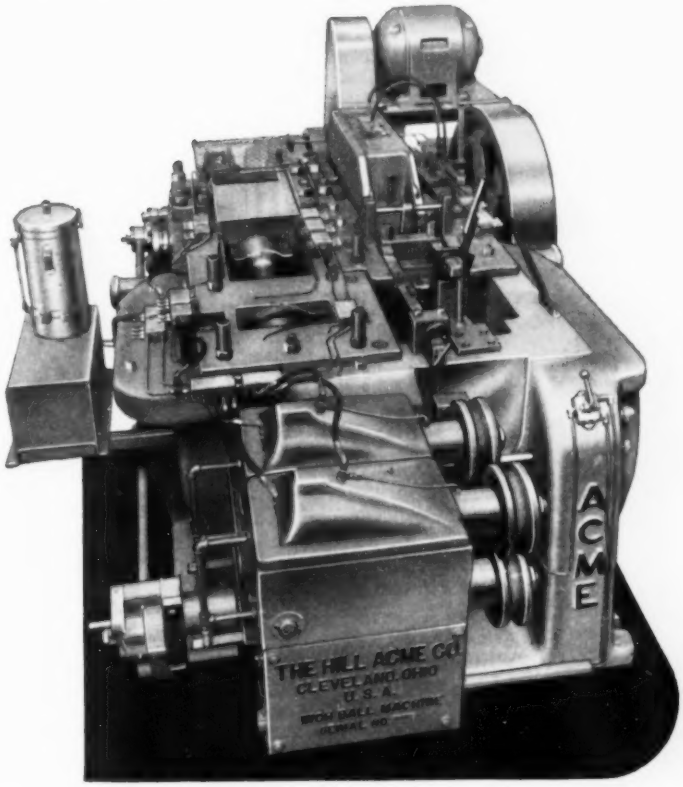


Typical Shapes Produced by ACME Single Blow Forging Machines

# SINGLE BLOW FORGINGS
## AT 135 PER MINUTE

● One man operating this ACME single blow solid die forging machine is producing 135 one inch hard steel balls per minute from 11/16" stock. Automatic feed rolls carry bar stock at proper speed for maximum efficient operation. Adequate safety devices prevent jamming of the die.

ACME solid die forging machines are rated according to the size ball they will forge. Machines are built from 1" to 5" capacity.




*Complete information is given in Bulletin SB-57.*

**The HILL ACME Company**

**1207 W. 65th STREET • CLEVELAND 2, OHIO**

*Manufacturers of:* **"ACME" FORGING • THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BAR-BILLET SHEARS "HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • "CLEVELAND" KNIVES • SHEAR BLADES**



CIRCLE 434 READER SERVICE CARD

**EASY AS IT LOOKS!**
**NEW ADD-A-UNIT MANIFOLDS WITH ELECTRICAL PLUG-INS SIMPLIFY MULTIPLE AIR INSTALLATIONS**

Consider the advantage of single manifold units—as a standard stock item—which allows you to design and build your own manifolds of from two to ten valves. And with electrical plug-ins the body simply plugs onto the base to complete the wiring. Write for information on the revolutionary 4-way Dual-Seal air valve. ¼", ⅜", ½" port sizes.

**MECHANICAL AIR CONTROLS, INC.**
10030 Capitol, Oak Park
Detroit 37, Michigan
Export Representative: Ad Auriema, 85 Broad St., NYC 4

MAC

CIRCLE 435 READER SERVICE CARD

# SAVE 50%
or more in
# CONTOUR GRINDING COSTS with Micromaster

VISUAL GRIND

Sold by
***Brown & Sharpe Mfg. Co.***
Providence, Rhode Island

Visual Grind is manufactured by
**The CLEVELAND GRINDING MACHINE Co.**
1720 EDDY ROAD • CLEVELAND 12, OHIO

CIRCLE 437 READER SERVICE CARD

2746

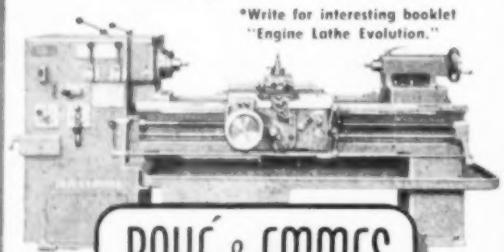
# SINCE 1895

**BOYE AND EMMES LATHES TURN COSTS DOWN***

| | |
|---|---|
| 1895 | Single Back Gear Cone Lathes |
| 1900 | Quick Change Gearbox |
| 1910 | Double Back Gear |
| 1920 | All Geared Headstock |
| 1930 | Anti-Friction Bearings |
| 1940 | Steel Vees — High Speeds |
| 1950 | Tracer Controlled |

**1959** Ask about it
Write about it
Come see it

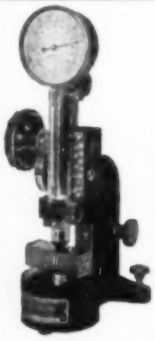
*Write for interesting booklet "Engine Lathe Evolution."



**BOYE & EMMES**
**MACHINE TOOL COMPANY**
125 CALDWELL DRIVE
CINCINNATI 16, OHIO
MACHINE TOOL CENTER of the WORLD

# DATA ON METALWORKING EQUIPMENT USED IN 44 MAJOR INDUSTRIES

Are you interested in a more thorough breakdown of the industry statistics published in the American Machinist Inventory? If so, you can get full details on what is available by writing, American Machinist, Metalworking Market Dept., 330 W. 42nd St., N. Y. 36, N. Y.



MODEL D

**SHORE SCLEROSCOPE HARDNESS TESTERS**

***Pioneer American Standard SINCE 1907***

Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Hardness Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.

*OVER 40,000 IN USE*

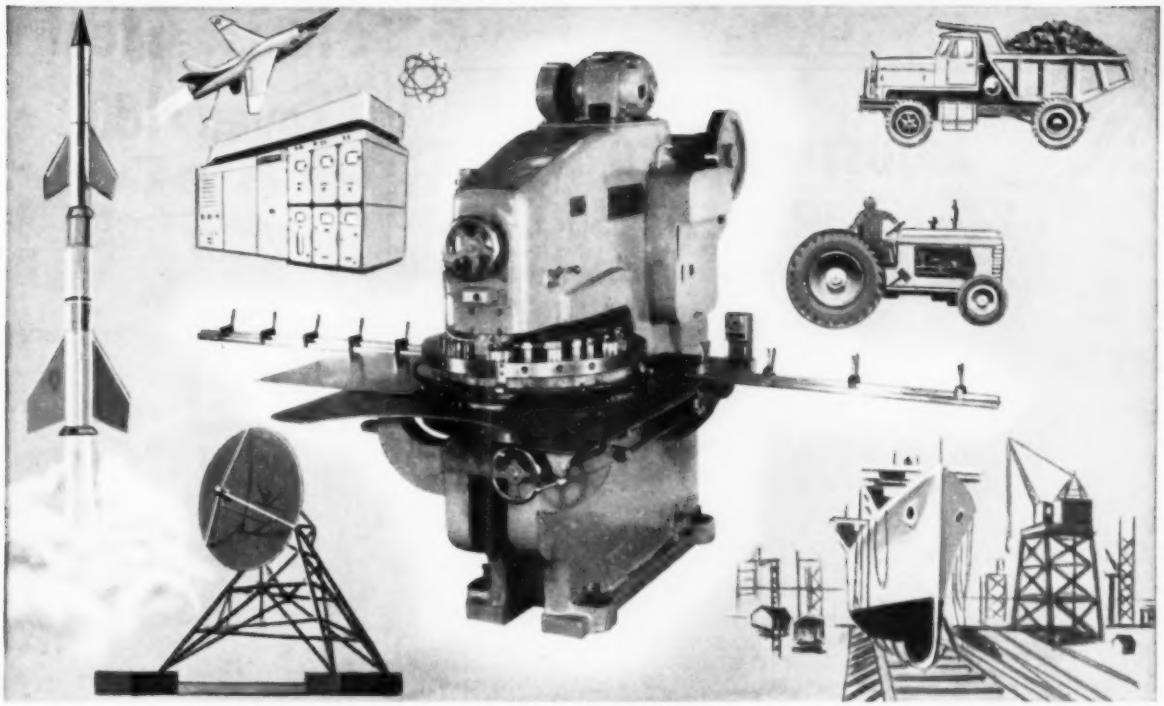
**THE SHORE INSTRUMENT & MFG. CO., INC.**
90-35B Van Wyck Exp.
Jamaica 35, N. Y.

MODEL C-2

CIRCLE 439 READER SERVICE CARD



CIRCLE 436 READER SERVICE CARD



# WIEDEMANN PIERCES THE TIME AND COST BARRIER

Wherever openings must be produced in sheet metal or plate . . . and quantities range from one to hundreds of a kind. Wiedemann Turret Punch Presses are paying big dividends throughout industry. Direct savings of 60% to 90% are commonplace—here's why:

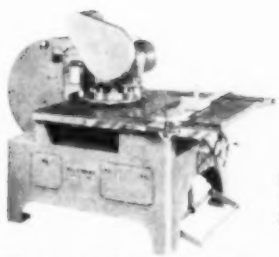
## the WIEDEMANN METHOD

**. . . Eliminates These Costly Factors**

- layout and setup
- burning, drilling, nibbling, fly cutting, etc.
- deburring and cleaning
- die sets and multiple tool setups

**. . . Gives you the unmatched Speed and Flexibility of a Turret Punch Press**

- Locates and produces openings accurately at low cost.
- All tools in turrets ready for use.
- Only one punch and die of a size required.
- Engineering changes made on-the-spot.
- Parts produced as required in minutes.
- Simplifies design, engineering and production.
- Pays for itself with savings in two years or less.



RA-41P Wiedemann
15-ton capacity
28" throat depth

Other models from 4 to 150 tons

**Take a closer look at your "hole" cost situation in terms of the Wiedemann Method. Send drawings of your work for time study and write for Bulletin 301.**

**WIEDEMANN MACHINE COMPANY**
**TURRET PUNCH PRESSES**

DEPT. AM-5 • GULPH ROAD • KING OF PRUSSIA, PA.



CIRCLE 440 READER SERVICE CARD

*Briney Precision Boring Heads Permit*

# ADJUSTMENTS TO TENTHS IN A FEW SECONDS

**No loosening or tightening of any screws required. Just rotate a graduated adjusting collar with a spanner wrench**

BRINEY

**SIZE-POSITIVE BORING HEADS** are also designed for special boring applications. Some examples

- Special Briney Boring Head for bottom facing and I.D. boring with precision depth and bore control.

- Special Briney Head for automatic retraction and feed out.
- Miniaturized heads for cluster boring.
- Block-type tooling for precision boring and O.D. turning used on vertical or horizonal bed multi-purpose machines.

NOW, the patented Briney Principle incorporated into a new precision boring head design and construction gives you all-around savings never before possible. Initial set-up time is drastically reduced and only a few seconds is required to adjust a Briney head for operational tool wear. Scrappage is minimized.

The head is of built-up construction on pre-loaded balls to offer extreme tool rigidity, long life, easy and economical bar replacement. There are no parts to wear that could result in sloppy fits and difficult tool wear adjusting control after extended use. On the job tests indicate balls act as vibration dampeners and eliminate chatter. Fine finishes are obtainable to eliminate many secondary operations.

Size-positive adjustments permit precision control over bore sizes. Very slight bar offset permits speeds up to 9000 rpm, minimizing out-of-balance operation. Manufactured from high quality tool steels and finish ground all over for balance controlling purposes. Every head, special or standard, is individually calibrated after assembly to assure size-positive adjusting control.

Six standard styles to fit most boring applications available off-the-shelf for quick delivery at prices you normally pay for ordinary boring heads.

*WRITE TODAY FOR CATALOG and see for yourself the savings you can realize from using Briney Precision Boring Heads*

**BRINEY MANUFACTURING CO.** 1165 SEBA ROAD PONTIAC, MICHIGAN

CIRCLE 441 READER SERVICE CARD

# *The* LINLEY JIG BORER

***A Precision Tool — Compact — Simple To Operate***

**How long can you afford to tie-up large capacity borers for toolroom work? Linley Jig Borers, made specifically for the purpose, can handle all of your small precision jig boring—fast and efficiently. Investigate the possibilities in these Linley precision-producers . . . for more flexibility in your shop, for savings in money and machines.**

*Table Size: 7" x 17½"; Table Travel: 6½" x 10".*

**IT WILL PAY YOU TO INQUIRE — WRITE NOW!**

**LINLEY BROTHERS CO.**

664 STATE ST. EXT. • BRIDGEPORT 1, CONN.

# Plastic Steel® saved $180

Within a matter of 2 hours this holding fixture was poured and ready for use at General Electric, and the cost — about $20.00 instead of the original $200.00. Whether you need jigs, fixtures, metal forming dies, molds, models, foundry patterns and core boxes or other special tools, PLASTIC STEEL® and other Devcon products will produce a precision form and save hundreds of dollars and hours.

Hundreds of companies have found money-saving advantages by using PLASTIC STEEL for tooling *and* maintenance. It can be used for repairing worn machine parts, cracked castings, leaking hydraulic systems and tanks, rebuilding worn pumps or valves, etc. — make 1001 on-the-spot repairs.

PLASTIC STEEL® — as easy to use as modeling clay — hardens to steel-like strength in 2 hours . . . can be machined with regular tools . . . bonds all metals, wood, glass, concrete, etc., to itself or each other. It has extremely high tensile, compression and impact strength — excellent chemical resistance.

**Find out how PLASTIC STEEL . and other Devcon products can save time, speed production and cut maintenance costs in your plant — write for FREE bulletin today.**

*Distributed nationally by leading industrial suppliers*

**DEVCON CORPORATION**

17 Endicott Street, Danvers, Mass.

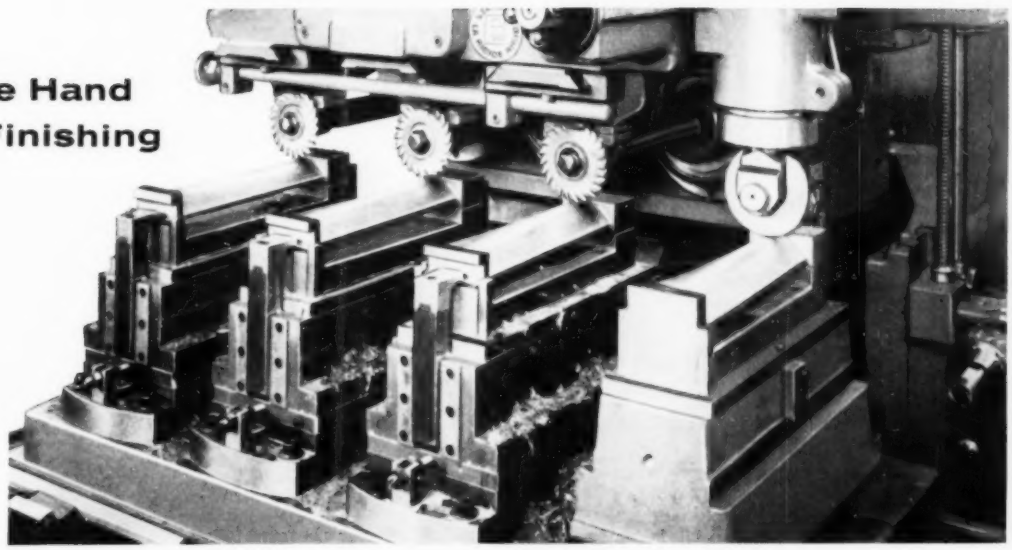


CIRCLE 442 READER SERVICE CARD

CIRCLE 443 READER SERVICE CARD

# Mill Turbine Blades Faster With Finer Surface Finish On A Rigid ST-100

## Reduce Hand Finishing



3-spindle Rigid ST-100 finish milling turbine blades.

This new Rigid ST-100 Automatic Blade Miller will cut production costs and improve the quality of your turbine blade milling at the same time. Rigid's new and greatly improved milling method produces an extremely fine finish in less time on jet engine and gas and steam turbine blades up to 16″ blade section length.

### COMPARE THESE RIGID FEATURES

**Automatic Cycle Control** — fool-proof, single lever control permits operation by unskilled hands, takes less operator time—provides automatic switch-over from pendulum milling along the shroud to fast sweep-milling along the blade length.

**High Working Accuracy** — to ±.002″ provides fine surface finish—keeps necessary allowance for hand finishing time to a minimum. Milled blades often require only little polishing.

Rigid ST-100 Automatic Hydrocopy Turbine Blade Milling Machine.

**High Production**—Sweep milling feeds up to 40 in./min. Feed rate remains constant over profile angles up to 80°. Extremely heavy cuts are possible.

**No Blade Deflection**—thin blades are nested to eliminate deflection and vibration during machining.

**Hydraulic Clamping**—by universal clamps holds pieces rigidly for heavy roughing.

**Other Features**—16 spindle speeds from 24-420 rpm • spindle-drive by 10-12 H.P. motor • supplied as 3-spindle machine (2 spindles optional) • additional transverse copying device and vertical spindle attachment permitting 3-dimensional machining of blades with complex shrouds.

**Write for more information.**

**COSA** — *nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

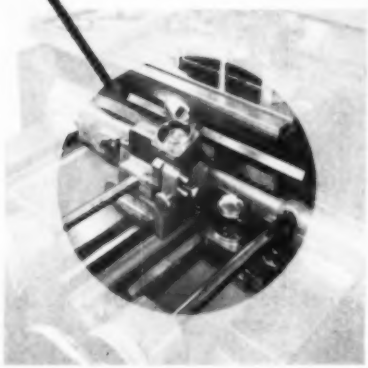
COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

# How to do precision jig boring in less time, at less cost

## Jigmaster with optical measuring

Among medium size jig borers the Jigmaster stands alone for accuracy, capacity and speed! To its outstanding performance record add exceptional savings in time and effort on jig and fixture work, as well as small quantity production jobs.

VERNAC—direct reading optical measuring adds another "plus" to Jigmaster's many features for fine precision machining. Vernac can be adjusted for readings to .0001"—checks location during machining—does away with end measuring rods.



**Other Jigmaster features include:**

- ★ Totally enclosed spindle and quill, mounted on super-precision ball bearings.
- ★ Extra wide base offers full support for saddle and table.
- ★ Choice of 3 table and saddle devices for hole location.
- ★ 18" x 24" table—travel, 20" longitudinal, 15" cross.
- ★ Rapid traverse, per minute 100".
- ★ Table to spindle, max. 23"; min. 3".
- ★ Column to spindle, at table, 20".
- ★ Spindle speeds, 16—50 to 2500 rpm.

**INVESTIGATE THE JIGMASTER NOW...WRITE FOR CATALOG**

**W. B. KNIGHT MACHINERY COMPANY**
3920 WEST PINE BOULEVARD • ST. LOUIS 8, MISSOURI

CIRCLE 445 READER SERVICE CARD

## HERE'S YOUR MOST INFORMATIVE REFERENCE SOURCE FOR WORKING STEEL

No textbook, manual, handbook or other publication offers you all in one place as much useful and current information on working ferrous metals as does our special report on *How to Work Steel*. 128 pages are devoted specifically to each type of steel, its properties, and the best techniques for all working methods. The entire report is illustrated profusely with graphs, diagrams, and tables highlighting all important operations.

*To order extra copies of this report for yourself or your associates, simply write or call our Reader Service Department today. Copies are only 50c each.*

**American Machinist**
**McGraw-Hill Building, New York 36, N. Y.**

# Over 200 Electropunches now in use at KODAK!

For speed, efficiency, and economy, Eastman Kodak Co. uses over 200 Electropunches and Electrostakes for multiple staking and riveting operations on camera components. Here are 8 good reasons why:

- **Lightning speed** — .025 of a second operating cycle
- **Controlled impact** — from feather touch to 10,000 lbs.
- **Effortless operation** — a touch of hand or foot
- **Versatile** — for staking, riveting, crimping, swaging, marking, etc.
- **Mobile** — all-electric, plug into any 115V line
- **Save money** — economical price, operating cost
- **Save space** — occupy less than square foot of bench space
- **Save maintenance** — just two moving parts

Electropunches: In 4 Models designed to do staking jobs with ease and economy.

Send for free 12-page catalog describing our complete line of production tools and accessories.

**BLACK & WEBSTER, INC.**
Dept. 30, 445 Watertown St., Newton, Mass.

CIRCLE 447 READER SERVICE CARD

*From General Motors...*

# A RELIABLE SOURCE OF QUALITY DIE CASTINGS

*Brown-Lipe-Chapin offers you extensive die casting, electroplating and stamping facilities for immediate volume production!*

In a new diversification program, Brown-Lipe-Chapin offers its die casting and metal stamping services to manufacturers outside the automotive field. Leaders in the field of quality bright work, Brown-Lipe-Chapin now seeks to contribute proven quality and add new sales appeal to your product.

*You'll get results in reliability!* A fully qualified staff of engineers—experienced and skilled in all phases of die casting and steel or aluminum stamping—will recommend the best and most economical way of producing your parts. Also, you will find that the low cost includes a number of important Brown-Lipe-Chapin extras that add nothing to the price, yet may add significant advantages to your product.

Here are some important Brown-Lipe-Chapin extras:

- Facilities for mass-producing die castings and steel or aluminum stampings, with related processes of anodizing, electroplating and painting *all under one roof.*
- Quality that's rigidly controlled step by step . . . quality that has been proven by successfully meeting the rigid standards and specifications of the automotive field for years.
- Advance research to improve products and methods. For example, recently a new dimension in durability was achieved with the first major advance in the chrome plating industry in twenty-five years.
- Mass-production experience that assures delivery to meet your schedules *right on time.*
- A guarantee to every new customer to supply their die casting and stamping requirements for as long as they may want to specify.

We welcome the opportunity to talk to you about your current needs and future plans. Contact Brown-Lipe-Chapin, Division of General Motors Corp., Syracuse, N.Y.

*SYRACUSE, N. Y.*
*This 10-acre plant has complete modern facilities to stamp, die cast, anodize, plate and paint parts to exact specifications.*

*ELYRIA, OHIO.*
*This 15-acre plant is equally capable of supplying your volume requirements. And its central location means fast delivery.*

GM GENERAL MOTORS

RELIABILITY by BROWN·LIPE·CHAPIN

DIVISION OF GENERAL MOTORS CORPORATION

Cimco

**SELECT MACHINE TOOLS**

#2 Cincinnati Dial Type High Speed Vertical Mill, powerfeed to head, late type.

3'11" column American Holewizard Radial Drill, motor on head, 12 speeds, late.

#4 Cincinnati Hi Speed Dial Type Plain Mill, table 78½" x 16½", 16 speeds to 1300 RPM.

10" x 102" cc LeBlond Hv. Duty G. H. lathe, 12 spindle speeds 15 to 525, late type.

30" x 29' cc LeBlond Hv. Duty G. H. Lathe, late type, 2 carriages, tapers, swings 34½", 16 speeds.

12"Morey Vert. Slotter AC motor drive, 24" rotary table, latest type.

14' x 14' x 30' Betts Double Housing Planer, 50 HP DC motor, 4 heads, box table.

16" x 78" Monarch Model CW Lathe, Timken bearing, hardened ways, taper attachment, late type.

18" x 40" x 96" centers Norton Type "C" Cylindrical Grinder, two gaps, swing 40" and 28" in gaps, mechanical feed, late type.

20" Gould & Eberhardt Industrial Shaper, vise, front support, new 1947.

24" x 96" centers Boye & Emmes G.H. Lathe, 12 speeds, timken, late taper.

45T Giddings & Lewis table type boring mill, table 40 x 48, outer support, late type.

Cincinnati Machinery COMPANY

3901 Kellogg Ave., Cincinnati 26, Ohio
Phone TRinity 1-0853
CIRCLE 500 READER SERVICE CARD

**MACHINE TOOLS**
**FOR SALE—FROM STOCK**
**RBG—Rebuilt & guaranteed**
**RCG—Reconditioned & guaranteed**

AUTOMATIC
1¼" Warner & Swasey 6 Spdl. (1955) $27,500
BOREMATIC
#45 Heald, Dbl. End, 4 Spdl, RBG (1947) 12,500
VERT. BORING MILL
24" Bullard Vtl. w/side head Excel. 6,950
DUPLEX BROACH
5 ton—42" Cinci., Vert. Hydro (1950) 6,500
GRINDER
#109 Sheffield, Annular Form Crushtrue-Dresser '54
INT. GRINDER
109 Bryant New Spdl. RBG (1947) 6,950
MULT. DRILL
B2B—Natco 24 Spdl., Adjustable, Tapping (1942)
G-6 Natco 24 spdl., Adjustable, Tapping (1943)
ROTARY SURFACE GRINDER
16A2 Blanchard 2 Spdl. Autom. Sz'g (1948) 5,950
HD LATHE
27 x 84" Monarch 505 RPM. RBG (1942) 11,500
TURRET LATHES
#4 Warner Swasey, Barfeed, RBG (1942) 5,850
#5 Warner Swasey, Preset, 2½" Bar Feed #727164
#4A Warner Swasey 3" Hole, Cross Sliding Turret 1943 Rblt. 15,000
MULTIMATIC
10"—8 Spdl. Bullard D. Dbl Index (1942) Recond.
SHEARS
10'—10 Ga. Cinc. F&B Gage 1945 7,950
6'—14 Ga Wysong-Miles F&R Gage 1945 1,450

All Machines Carry Regular 30 Day Return Privilege Guarantee

**"MIDWESTERN"**
**336 Midland Bank Building**
**Minneapolis 1, Minnesota**

CIRCLE 501 READER SERVICE CARD

**WORLD'S LARGEST STOCK**
**STAMPING PRESSES**
SQUARING SHEARS • PRESS BRAKES
**REBUILT and GUARANTEED**

WILL LEASE WITH OPTION TO PURCHASE, OR WILL FINANCE OVER LONG TERM

JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
Philadelphia 34, Pa. Phone GArfield 3-8700

CIRCLE 502 READER SERVICE CARD


# SEARCHLIGHT SECTION

ADVERTISERS' INDEX AND BUYERS' REFERENCE

***Listed below are used, surplus new and rebuilt machine tools or services as advertised in this section.***

The numbers after the advertiser's name, indicates the products or services offered by the advertiser.

2. Automatics
6. Boring Mills
7. Broaching Machines
16. Drilling & Reaming Machines
23. Gear Cutting Machines
24. Grinding Machines
29. Lathes
33. Milling Machines
37. Planers
41 Presses
49. Services
50. Shears
51. Shapers


| ADVERTISER | PAGE NO. | KEY TO PRODUCTS OR SERVICES |
|---|---|---|
| Cincinnati Machinery Co. | 316 | 6, 24, 29, 33, 37, 51 |
| Eastern Machinery Co. | 317 | 23, 24, 51 |
| Hyman & Sons, Joseph | 316 | 41 |
| Lucas & Son, Inc., J. L. | 317 | 6, 29, 33 |
| Midwestern Machinery Co. | 316 | 2, 6, 7, 16, 24, 29, 50 |
| National Machinery Exchange | 317 | 41 |
| Uniondale Presicion Repair Service Co. | 317 | 49 |
| Wigglesworth Machinery Co., T. R. | 317 | 41 |


## SEARCHLIGHT Equipment Locating SERVICE

*"No Cost or Obligation"*

This service is aimed at helping you, the reader of "SEARCHLIGHT," to locate rebuilt and used machine tools and equipment. Not currently advertised. (This service is for USER-BUYERS only) No charge or obligation.

How to use: Check the dealer ads to see if what you want is not currently advertised. If not, send us the specifications of the equipment and/or components wanted on the coupon below, or on your own company letterhead to

**SEARCHLIGHT EQUIPMENT LOCATING SERVICE**
**c/o American Machinist**
**Classified Advertising Division, P.O. Box 12, N. Y. 36, N. Y.**

Your requirements will be brought promptly to the attention of the equipment dealers advertising in this section. You will receive replies directly from them.

---

**Searchlight Equipment Locating Service, c/o Classified Advertising**
**AMERICAN MACHINIST, P. O. Box 12, N. Y. 36, N. Y.**

Please help us locate the following equipment:

.....

.....

.....

NAME .....

TITLE ..... COMPANY .....

STREET .....

CITY ..... ZONE ..... STATE .....

5/18/59

**600 TON**
**HYD. PRESS**
**MODEL 6343**

67⅛" x 52¼" between post 48 x 45", stroke 38" approx. Max. daylight 5', double cushions Draw 18".

**T. R. WIGGLESWORTH MACHINERY CO.**
Route 8 at Alexander Rd.
Bedford, Ohio

CIRCLE 511 READER SERVICE CARD

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. BOX 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

***POSITION WANTED***

**Opportunity wanted to join a progressive company** manufacturing commercial items where my 30 years experience in the following lines could be used to best advantage—Machinist, Master Mechanic, Toolmaker, Diemaker, Foreman, Designer, Estimator and Supervisor. (Preferably Mass.) PW-1524, American Machinist.

## WANT MORE INFORMATION on Searchlight Advertisements?

- Take advantage of a new service available on Classified advertisements to secure more information. Use the handy, prepaid reader service cards (at the end of the magazine) to bring you more data. The Reader Service number appearing under each advertisement need only be circled on the card.
- Use this time-saving service to keep abreast of the latest in used, rebuilt, surplus new equipment, employment or business opportunities.

# Eastern Rebuilt Machine Tools

**THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY**

### GEAR SHAPERS

Type Z Fellows Horizontal, m.d.
No. 4 Fellows Enveloping Gear Generator, m.d.
No. 12 Fellows Gear Shaving Machine, m.d., late
No. 7, 7A Fellows Gear Shapers, belted m.d.
No. 7 Fellows, 1945
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61A Fellows, m.d., latest type, 1945
No. 645A3 Fellows, vee belt drive
No. 645Y Fellows, m.d.
No. 70 Cross Deburring Machine, m.d., 1940
No. 72 Fellows H.S. Spur Gear Shaper, m.d.
No. 75 Fellows, H.S., m.d.
No. 75A Fellows H.S. Spur & Helical, m.d.
No. 712 Fellows, m.d.
No. 7125A Fellows, m.d., H.S.
No. 725 Fellows, 1945

### GEAR CUTTERS

No. 12 Gleason Straight Tooth Bevel Gear Rougher, m.d.
No. 36 Gould & Eberhardt Bevel & Spur Gear Rougher, m.d.
No. 4B Fellows Gear Burnisher
No. 8B Fellows Gear Burnisher
3" Gleason Gear Generator, m.d.
48" Gleason Automatic Bevel Gear Planer, m.d.
No. 5AC Lees-Bradner Heavy Type Gear Generator, m.d.
No. 4-48" Brown & Sharpe, m.d.
No. 50 Cross Clutch Miller, m.d.
No. 5-60" Brown & Sharpe Gear Cutter, m.d.

### GEAR HOBBING MACHINES

Type A Barber-Colman, m.d.
Type S Barber-Colman, m.d.
Type T Barber-Colman, m.d., 1942
No. 1 Lees-Bradner Universal, m.d.
No. 12 Barber-Colman, double overarm, m.d.
No. 12 Barber-Colman, single overarm, m.d.
No. 34 Brown & Sharpe, m.d., spur & spiral
No. 130 Cleveland Vertical Rigid Hobber
No. 12H Gould & Eberhardt Universal Mfg. Gear Hobber, m.d.

### GEAR TESTERS

FPV-60 Maag Gear Wheel Co. Profile Testing Instrument
12" National Broach & Machine Co.
18" National Broach & Machine Co.
18" Gleason Bevel Gear Tester, m.d.
No. 471 Michigan Tool Co. Hob, Reamer & Gear Checker
National Broach & Machine Co. "Red Ring" Universal Gear Checker

### AUTOMOTIVE GRINDERS

No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d.
Kwik-Way Model H Piston Turning & Grinding Machine, m.d.

### CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
No. 3 Cincinnati, m.d.

### CRANKSHAFT GRINDERS

18x66" Landis Universal Type C, m.d., late
22x72" Landis Type CH, m.d., late

### CYLINDER GRINDERS

No. 50 Heald, m.d.,1945
No. 73 Heald Airplane Cylinder Grinder, m.d., new
No. 78 Heald Centerless Cylinder, m.d.

### EMERY GINDERS

48" Double End U.S. Electrical Co. Buffer
No. 5D Gardner H.D. Polishing Stand, 1948

### DISC GRINDERS

No. 14A Gardner Opposed Single, m.d.
No. 186-36" cap. Gardner, m.d., latest
No. 121 Hanchett Prod. Face Grinder, m.d.

**THE EASTERN MACHINERY COMPANY**
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1-1241 — CABLE ADDRESS EMCO

CIRCLE 503 READER SERVICE CARD

## MODERN TOOL & DIE SHOP

Will sell all or half interest—owner retiring

***EXCEPTIONAL OPPORTUNITY***

for a group interested in starting own business

**WRITE: 16516 James Couzens, Detroit 21, Michigan**
**or PHONE: UN 4-0266**

CIRCLE 504 READER SERVICE CARD

**INDUSTRIAL INSTRUMENT REPAIRS**

**PROMPT SERVICE**

Speed Indicators • Last Word Indicators • Dial Test Indicators • Swiss Indicators • Hand Tachometers • Dial Depth Gages, etc.

**UNIONDALE PRECISION REPAIR SERVICE CO.**
**646 Waverly Place, Uniondale L. I., N. Y.**

CIRCLE 507 READER SERVICE CARD

**MOTORS • GENERATORS**
**TRANSFORMERS**
NEW • REBUILT
**ELECTRIC EQUIPMENT CO.**
WORLD'S LARGEST INVENTORY
CALL COLLECT GL 3-4793
P. O. BOX 51 • ROCHESTER 1, N. Y.

CIRCLE 508 READER SERVICE CARD

**JOBBERS WANTED**

We manufacture Kob-Kleen (ground corn cobs) for deburring, burnishing, polishing and soft grit blasting of metals; metal stamping absorbents, etc. Nationally advertised.

**COEVAL, INC.**
Dept. D, St. Joseph, Illinois

CIRCLE 509 READER SERVICE CARD

**OVER 1,000 NEW AND USED MACHINE TOOLS IN STOCK**
**WRITE FOR LATEST STOCK LIST**
**MILES MACHINERY COMPANY**
7039 EAST GENESEE • SAGINAW, MICH. PL. 2-3105

CIRCLE 510 READER SERVICE CARD

## PRACTICALLY NEW PRESSES

525 tons, Bliss #96½-60, Bed 60"x54", Str. 8"
160 tons, Bliss #6½-60, Bed 60"x30", Str. 6"
150 tons, Bliss #S2-150-60-36, Str. 8", New 1954
140 tons, Bliss #93½H, Bed 84"x36", Str. 16"
120 tons, Bliss #5½-48W, Bed 48"x30", Str. 8"
500 tons, Bliss #10-72, Bed 72"x64", Strs. 12"
Warco—Double Crank Bed 180"x64" Double Roll Feed, Uncoiler, Straightner 600 Tons
135 tons, Bliss #6-48, Bed 48"x30"
100 tons, Bliss #5-36, Bed 36"x28"

*Air Clutch, Air Cushions.*
*"If it's machinery; We have it."*

**NATIONAL MACHINERY EXCHANGE**
**138 Mott St., N. Y. CAnal 6-2470**

CIRCLE 505 READER SERVICE CARD

## JUST PURCHASED

64" Giddings & Lewis Hypro Vertical Boring Mill—1952

16" x 54" Monarch Model CY Geared Head Lathe, taper—1941

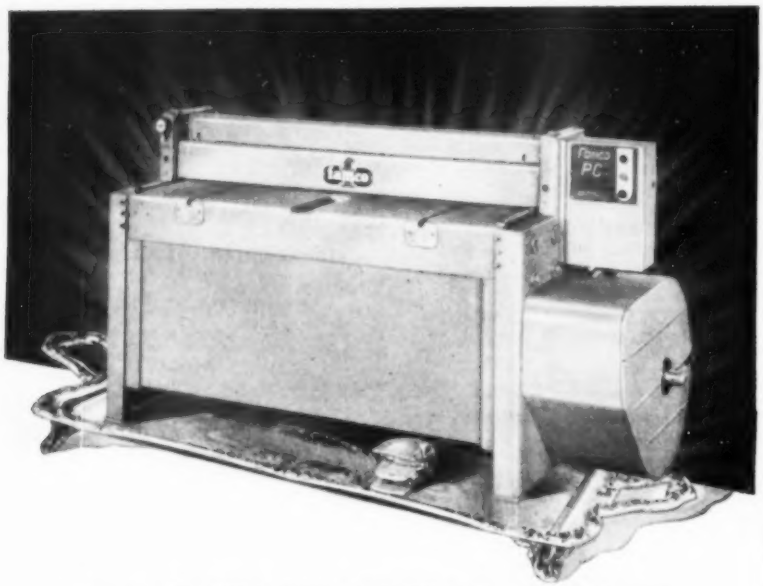
Cincinnati #000-4 Unit Type Miller—1948

#56-96 Cincinnati Hydromatic Miller—1942

#2CH Kearney & Trecker Plain Miller, Mono-lever control—1954

**J. L. LUCAS & SON, INC.**
**Bridgeport 5A, Connecticut**

CIRCLE 506 READER SERVICE CARD



## Famco's Hi-Speed "PC"* Power Shears offer you faster, cleaner, superior cutting

*"PC" means pneumatic friction clutch and brake.

It also means that Famco "PC" Power Shears give you high speed shearing (300 strokes per minute), cleaner cutting (knife cuts further into the material before fracturing) and there is less "humping" when used with automatic cut-off lines.

Get all the BIG facts on Famco's new "PC" Power Shear line. And should you need a special shear, Famco can design and build it. Send for the "PC" Power Shear brochure.

Low inertia pneumatic friction clutch and brake never needs adjusting

famco machine company

3136 Sheridan Road • Kenosha 5, Wisconsin

PRESSES...AIR, ARBOR, POWER, FOOT

SQUARING SHEARS, MILLING MACHINES, BAND SAWS

CIRCLE 449 READER SERVICE CARD

## NOW YOU CAN GET:

### MARKET DATA ON METALWORKING EQUIPMENT IN USE IN YOUR SALES TERRITORIES.

*American Machinist* can tailor the inventory to supply you with important facts about market potentials in each of your specific sales areas. For details, write *American Machinist* Market Dept., 330 W. 42nd St., New York 36.

# INDEX TO ADVERTISERS

*This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.*


| | Page |
|---|---|
| Air Reduction Sales Company Div. of Air Reduction Inc. | 288 |
| Alemite | 223 |
| Allen-Bradley Company | 227 |
| Allen Mfg. Company | 203 |
| Allis Chalmers Manufacturing Company | 273 |
| Allis Company, Louis | 301 |
| Allison-Campbell Div. American Chain & Cable Co., Inc. | 62 |
| Aluminum Company of America | 281 |
| American Chain & Cable Co., Inc. Allison-Campbell Div. | 62 |
| American Chain Division American Chain & Cable Co., Inc. | 62, 256, 298 |
| American Chain & Cable Wilson Mechanical Instrument Division | 298 |
| American Machinist | 275 |
| American Saw & Mfg. Company | 226 |
| American Tool Works Co. | 23 |
| Ames Company, B. C. | 292 |
| Ames Precision Machine Works | 300 |
| Amplex Division Chrysler Corp. | 324 |
| Armco Steel Corporation | 114 |
| Armstrong Blum Mfg. Co. | 300 |
| Armstrong Brothers Tool Company | 24 |
| Aro Equipment Company | 290 |
| Associated Spring Corp. | 277 |
| Baird Machine Company | 230 |
| Baker Bros., Inc. | 297 |
| Barber-Colman Co. | 37, 47 |
| Bath & Co., Inc., John | 207 |
| Bausch & Lomb Optical Co. | 254 |
| Baush Machine Tool Co. | 269 |
| Bay State Abrasive Products Co. | 66-67 |
| Beatty Machine & Mfg. Co. | 209 |
| Beaver Pipe Tools, Inc. | 191 |
| Bijur Lubricating Corporation | 206 |
| Black & Webster, Inc. | 314 |
| Bliss & Laughlin Inc. | 220-221 |
| Boye & Emmes Machine Tool Co. | 310 |
| Bridgeport Brass Company | 193 |
| Briney Mfg. Co. | 312 |
| Brown & Sharpe Mfg. Co. | 51 |
| Brown Lipe Chapin Div. of General Motors Corp. | 315 |
| Bryant Chucking Grinder Co. | 64 |
| Buffalo Forge Co. | 204-205 |
| Bullard Co. | 27 |
| Bunting Brass & Bronze Co. | 239 |

# INDEX TO ADVERTISERS


| | Page |
|---|---|
| Capewell Mfg. Co. | 92 |
| Card Division, S. W. Union Twist Drill Company | 74 |
| Carlton Machine Tool Company | 46 |
| Carpenter Steel Company | 58 |
| Century Electric Company | 217 |
| Chambersburg Engineering Co. | 268 |
| Cincinnati Gilbert Machine Tool Co. | 242 |
| Cincinnati Milling Products Div. Cincinnati Milling Machine Co. | 49 |
| Cincinnati Milling Machine Co. Milling Machine Division | 5, 6-7 |
| Cincinnati Shaper Company | 39 |
| Clearing Div. of U. S. Industries Inc. | 215 |
| Cleveland Automatic Machine Co. | 116 |
| Cleveland Grinding Machine Co. | 310 |
| Cleveland Twist Drill Co. | 237 |
| Cogsdill Twist Drill Co. | 3rd Cover |
| Columbus Die-Tool & Machine Co. | 247 |
| Continental Tool Works Div. Ex-Cell-O Corporation | 63 |
| Convair—A Division of General Dynamics Corp. | 260 |
| Copperweld Steel Co. | 158 |
| Cosa Corporation | 313 |
| Covel Manufacturing Company | 200 |
| Cuno Engineering Corp. | 282 |
| Cushman Chuck Company | 106 |
| De Laval Steam Turbine Company | 280 |
| Delta Power Tool Div., Rockwell Mfg. Co. | 257 |
| Devcon Corporation | 312 |
| DeVlieg Machine Company | 44-45 |
| DoAll Company | 81 |
| Dreis & Krump Manufacturing Company | 210 |
| Dunham Tool Co. | 300 |
| Dykem Company | 304 |
| Eagle Picher Company | 214 |
| Eastman Kodak Co. Special Products Sales | 177 |
| Eisler Engineering Co., The | 304 |
| Elgin National Watch Co. Abrasive Div. | 192 |
| Emhart Mfg. Co. | 296 |
| European Machine Tool Exhibition | 276 |
| Ex-Cell-O Corporation | 63, 77, 100 |
| Fafnir Bearing Company | 261 |
| Famco Machine Company | 318 |
| Federal Machine & Welder Co. | 303 |
| Federal Products Corporation | 86-87 |
| Fellows Gear Shaper Company | 8-9 |


*(Continued on page 320)*


MOLINE

FOR GREATER PRODUCTION • EFFICIENCY • SAVINGS

*Use rugged, reliable "Hole Hog" machine tools for such jobs as:*

★ Multi-Spindle Boring ★ Single and Multi-Spindle Honing
★ Straight Line Multi-Drilling ★ Adjustable Spindle Drilling
★ Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
★ Special Multiple Operation Machine Tools

Twenty-Station, Ten-Unit Transfer Machine for boring, counterboring, chamfering and valve clearance operations on V-8 automotive engine blocks. (Shown)

Over 58 years of MachineTool Engineering experience is at your service. Tell us your particular problem.

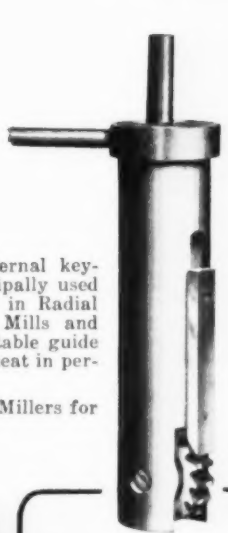
MOLINE TOOL COMPANY
100 20TH STREET • MOLINE, ILLINOIS

REPRESENTATIVES IN PRINCIPAL CITIES

CIRCLE 451 READER SERVICE CARD

THE KEY TO BETTER KEYSEATS

NATIONAL
Keyseating Millers



**NATIONAL** Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

You can depend on National Keyseating Millers for all your keyseating jobs.

national
MACHINE TOOL CO.
CINCINNATI 22, OHIO

WRITE TODAY
for Catalog No. 17
complete, handy size

CIRCLE 452 READER SERVICE CARD

*drills holes in "hard-to-get-at" places . . .*

*. . . replaces angle drills*

NEW!

**Winslow**

# SPACEMITE

Air-Powered **DRILL MOTOR**

With the heavy duty, rugged SPACEMITE you can drill holes within ¼" of bulkheads and other obstructions and within 9/32" radius in 90° corners. Replaces angle drills for most limited-access-area drilling.

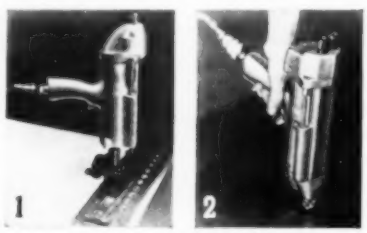
SPACEMITE accommodates standard threaded shank drills (¼—28 thd.), capacity through ⅜" diameter. Accommodates larger drills under overload conditions.

Start now to enjoy the cost-saving, increased-production benefits of the SPACEMITE in your plant.

HERE ALSO, ARE TWO WINSLOW AUTOMATIC POWER TOOLS YOU SHOULD KNOW ABOUT.

**1 SPACEMATIC DRILL MOTOR**
A heavy duty tool that approaches automation on drill countersinking applications. One of the most sensational cost-saving tools ever introduced to industry.

**2 NUTPLATE DRILL MOTOR**
A portable power tool used on Nutplate installations.




*Write Today* . . . for new SPACEMITE Bulletin and name of your nearest dealer. Also ask for data on SPACEMATIC and NUTPLATE Drill Motors.

**Winslow PRODUCT ENGINEERING CORPORATION**
47 ST. JOSEPH STREET • ARCADIA, CALIFORNIA
*Manufacturers of vacuum hand tools and accessories for the nation's aircraft and manufacturing plants.*

CIRCLE 453 READER SERVICE CARD



## Looking For Something?

***—of course you are. Every reader of American Machinist is.***

Some find what they are looking for in the editorial pages, some in the advertising by manufacturers, some in the "Searchlight" advertisements. The latter includes many advertisements seeking or offering "something" — used, rebuilt, surplus new equipment, or a business opportunity that you may be able to supply, or want.

You will always find checking the "Searchlight" ads interesting, informative and profitable.


## INDEX TO ADVERTISERS

(Continued from page 319)


| | Page |
|---|---|
| Felters Company | 199 |
| Fiske Brothers Refining Co. | 306 |
| Floridin Company | 298 |
| Fosdick Machine Tool Company | 59 |
| Frauenthal Div, Kaydon Engineering Corp. | 212-213 |
| Gisholt Machine Company | 33-36 |
| Goss & de Leeuw Machine Company | 194 |
| Grant Mfg. & Machine Company | 300 |
| Graphic Systems | 302 |
| Gray Co., G. A. | 28-29 |
| Graymills Corporation | 240 |
| Greaves Machine Tool Company | 274 |
| Grieder Industries | 306 |
| Gulf Oil Corporation | 30-31 |
| Hamilton Tool Company | 322 |
| Hanson-Whitney Company | 244 |
| Hardinge Brothers, Inc. | 76 |
| Harnischfeger Corp. | 283 |
| Hayes, Inc., C. I. | 216 |
| Heald Machine Co., Sub. Cincinnati Milling Machine Co. | 2nd Cover |
| Heller Tool Co., Sub. Simonds Saw & Steel Co. | 50 |
| Hill Acme Company | 309 |
| Hones, Inc., Charles A. | 222 |
| Index Machine Company | 296 |
| Ingersoll Kalamazoo Div. Borg-Warner Corp. | 308 |
| Ingersoll Milling Machine Co. | 201 |
| Ingersoll-Rand Company | 299 |
| Inland Steel Company | 211 |
| I-T-E Circuit Breaker Co. | 305 |
| Jessop Steel Co. | 83 |
| Johnson Bronze Company Sub. Apex Bronze Foundry Co. | 154 |
| Johnson & Son, Inc., S. C. | 88-89 |
| Jones & Lamson Machine Company | 48, 183, 185, 187, 189 |
| Jones & Laughlin Steel Corp. Stainless & Strip Division | 289 |
| Kenco Mfg. Co. | 222 |
| Kennametal Inc. | 264 |
| Kent-Owens Machine Company | 272 |
| Kingsbury Machine Tool Corp. | 267 |
| Knight Machinery Co., W. B. | 314 |
| Landis Machine Company | 10-11 |
| Landis Tool Company | 12-13, 25 |
| Lange Engineering, Erich | 298 |
| La Salle Steel Co. | 249 |
| Le Blond Machine Tool Co., R. K. | 40-41 |
| Le Maire Machine Tool Co. | 72-73 |

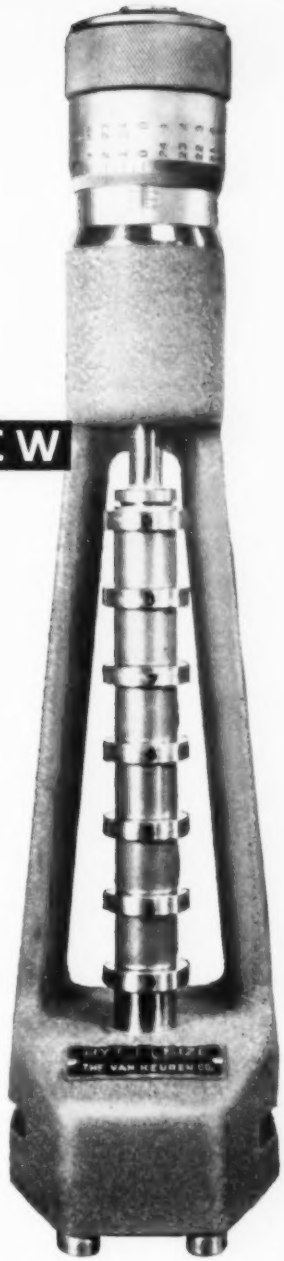
# INDEX TO ADVERTISERS


| | Page |
|---|---|
| Lilly & Co., Eli Agricultural & Industrial Products Div. | 270 |
| Lincoln Electric Company | 293 |
| Linde Div. Union Carbide Corporation | 278 |
| Linley Brothers Co. | 312 |
| Lipe Rollway Corp. | 224 |
| Lodge & Shipley Company | 38 |
| Lucas Machine Division New Britain Machine Co. | 97, 98 |
| Madison Industries Inc. | 279 |
| Mahon Company, R. C. | 263 |
| M. B. I. Export & Import Ltd. | 236 |
| Malleable Casting Council | 178-179 |
| Manhattan Rubber Div. Raybestos-Manhattan Inc. | 255 |
| Mechanical Air Controls Inc. | 310 |
| Metallurgical Products Dept., General Electric Company | 108 |
| Micromatic Hone Corp. | 234-235 |
| Micrometrical Mfg. Co. | 252 |
| Minneapolis Honeywell Regulator Co. Machine Control Group | 307 |
| Moline Tool Company | 319 |
| Monarch Machine Tool Co. | 65 |
| Moore Special Tool Co., Inc. | 294 |
| Motch & Merryweather Machinery Company | 20-21 |
| Mueller Brass Company | 84-85 |
| National Acme Company | 70-71 |
| National Automatic Tool Co., Inc. | 79, 80 |
| National Broach & Machine Co. | 241 |
| National Machine Tool Company | 319 |
| Nebel Machine Tool Corp. | 259 |
| New Britain Machine Co. The Lucas Machine Division | 97, 98 |
| New Britain Machine Company New Britain Gridley Machine Div. | 52-55 |
| New Jersey Zinc Company | 22 |
| Niagara Machine & Tool Works | 245 |
| Nice Ball Bearing Company | 271 |
| Noble & Westbrook Mfg. Co. | 94 |
| North American Aviation Inc. | 306 |
| Norton Company | 56-57 |
| Nu-Tap | 298 |
| Oakite Products Inc. | 258 |
| Oliver Instrument Company | 262 |
| Olofsson Corporation | 190 |
| Orban Inc., Kurt | 175 |
| Pacific Industrial Manufacturing Co. | 32 |
| Perfection Gear Co. American Stock Gear Div. | 208 |


(Continued on page 322)


HYT Size Gage, 10" model

Available accessories:
18" transfer gage
3" and 6" riser blocks



Your surface plate needs this **NEW** dimensional gage, the **VAN KEUREN HYT SIZE GAGE**

Here's why:

- it embodies the well-known *Van Keuren precision.*
- it has a decided price advantage.
- permits amazing speed in setting all dimensions (a matter of a few seconds!)
- it's accurate to .000050" over entire range.
- has exclusive design features: a patented spring-loaded non-rotating spindle eliminates backlash . . . measuring surfaces are accessible from front and back . . . it can be used in a horizontal position.
- it's ruggedly built for long life.
- easily portable . . . can be used anywhere in shop.

**Now you can more quickly inspect** drill jigs, lathe fixtures, gears, cams, splines, profiles, contours . . . and check many shop operations. You can easily set precision depths on drill presses, milling machines, jig borers, etc.

*Write today for descriptive bulletin*

THE Van Keuren CO.
*Since 1920*
173 Waltham Street, Watertown 72, Mass.
PRECISION MEASURING TOOLS
. . . rated the world's most accurate
Plug Gages · Measuring Wires · Optical Flats and Light Wave Equipment · Gage Blocks · Precision Lapping Service and Parts




CIRCLE 455 READER SERVICE CARD

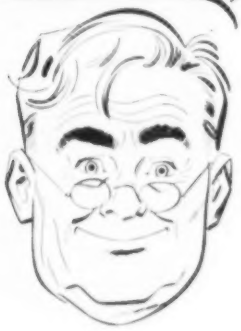
2739

YOU CAN
"PRECISION TAP"
PRECISION HOLES
ON THE

Hamilton

SUPER SENSITIVE TAPPING MACHINE

(000 - 120 to 10 - 24)
*"It masters the heart-break jobs"*



Ask for
FREE LITERATURE BATCH
No. T-821

**THE HAMILTON TOOL COMPANY**
**830 SOUTH NINTH STREET · HAMILTON · OHIO**

REPRESENTED IN CANADA BY
Sykes Tool Corporation, Ltd., Georgetown, Ontario.
Sykes Tool Corportaion, Ltd., 4950 Queen Mary Road, Montreal.

CIRCLE 456 READER SERVICE CARD


# YOU NEED IT

If you don't already have a copy of the American Machinist Inventory of Metalworking Equipment, you shouldn't waste time in securing one. The only publication of its kind in the world, the Inventory is a census of all Metalworking equipment in the United States—over 3,000,000 units.

It can be invaluable to you in finding out your plant efficiency in comparison with competition or the national average. To secure your personal Inventory, send $2.00 to Reader Service Department, American Machinist, 330 West 42nd Street, New York 36, N. Y. It's probably one of the best investments you'll ever make.


# INDEX TO ADVERTISERS

*(Continued from page 321)*


| | Page |
|---|---|
| Pipe Machinery Company | 96 |
| Pittsburgh Screw & Bolt Co. (Formerly) | 286-287 |
| Potter & Johnston Co. Sub. Pratt & Whitney Co., Inc. | 172-173 |
| Pratt & Whitney Co., Inc. | 170-171 |
| Precise Products Corp. | 251 |
| Producto Machine Co. | 291 |
| Raybestos-Manhattan Inc. | 255 |
| Reed Rolled Thread Die Company | 95 |
| Ruthman Machinery Company | 238 |
| S. K. F. Industries Inc. | 284 |
| Sales Service Mfg. Co. | 240 |
| Scherr Co., Inc., George | 304 |
| Schrader's Son, A., Div. Scovill Mfg. Co. Inc. | 78 |
| Sciaky Bros. Inc. | 266 |
| Screw & Bolt Corp. of America | 286-287 |
| Sharon Steel Corporation | 285 |
| Sheffield Corp. of Bendix Aviation | 104 |
| Shepard Niles Crane & Hoist Corp. | 233 |
| Shore Instrument & Mfg. Co., Inc. | 310 |
| Simonds Abrasive Co. | 110 |
| Simonds Gear & Mfg. Co. | 216 |
| Simonds Saw & Steel Company | 26 |
| Simpson Optical Manufacturing Co. | 323 |
| Sinclair Refining Co. | 253 |
| Sixth European Machine Tool Exhibition | 276 |
| Skinner Electric Valve | 69 |
| Snyder Corporation | 102 |
| Socony Mobil Oil Co., Inc. and Affiliates | 60-61 |
| Sossner Tap & Tool Co. | 218 |
| Springfield Machine Tool Co. | 82 |
| Square D Company | 93 |
| Stahl Gear & Machine Company | 300 |
| Standard Oil Co., (Indiana) | 42-43 |
| Stewart-Warner Corp. | 223 |
| Stromberg Carlson Electronics Div. General Dynamics | 246 |
| Sun Oil Company | 265 |
| Syndicat Des Constructeurs Francais | 276 |
| Taft-Peirce Mfg. Co. | 228-229 |
| Texas Co. | 156 |
| Textile Machine Works | 90-91 |
| Timken Roller Bearing Co. | 4th Cover |
| Tomkins-Johnson Company | 153 |
| Torit Manufacturing Company | 286 |
| Torrington Mfg. Company | 18-19 |
| Union Carbide Corp. Linde Company Division | 278 |
| Union Mfg. Co. | 302 |
| Union Twist Drill Company | 75 |
| United States Drill Head Co. | 68 |
| United States Graphite Co. | 225 |
| Universal Cyclops Steel Corp. | 219 |

# INDEX TO ADVERTISERS


| | Page |
|---|---|
| Van Keuren Company | 321 |
| Van Norman Machine Co. Div. Van Norman Industries, Inc. | 14-15 |
| Vascaloy-Ramet Corporation | 169 |
| Verson Allsteel Press Co. | 304 |
| Walker Co., Inc., O. S. | 202 |
| Walker-Turner Div. Rockwell Mfg. Co. | 308 |
| Warner & Swasey Company | 16-17 |
| Waterbury Farrel Foundry & Machine Co. | 181 |
| Wesson Co. | 231, 232 |
| Whitman & Barnes Inc. | 195-198 |
| Wiedemann Machine Co. | 311 |
| Williams & Co., J. H. | 113 |
| Wilson Mechanical Instrument Division American Chain & Cable Co., Inc. | 298 |
| Winslow Product Engineering Corp. | 320 |
| Woodworth Co., N. A. | 160 |
| Wyckoff Steel Company | 250 |
| Yoder Company | 274 |
| Youngstown Sheet & Tube Company | 295 |
| Zagar Inc. | 248 |



**American Machinist**
**ADVERTISING SALES STAFF**

**Atlanta 3** . . . W. O. Crank, 1301 Rhodes Haverty Bldg., Jackson 3-6951

**Boston 16** . . . T. H. King, J. H. Koch, 350 Park Square Bldg., Hubbard 2-7160

**Chicago 11** . . . W. J. Hering, Bayard Nicholas, 520 N. Michigan Ave., Mohawk 4-5800

**Cincinnati 8** . . . R. H. Anderson, Gifford W. Plume, Jr., 2637 Erie Ave., East 1-6110

**Cleveland 13** . . . William E. Surgner, 1165 Illuminating Bldg., 55 Public Square, Superior 1-7000

**Dallas 1** . . . Robert T. Wood, 901 Vaughn Bldg., 1712 Commerce St., Riverside 7-5117

**Denver 2** . . . John W. Patten, Mile High Center, 1740 Broadway, Alpine 5-2981

**Detroit 26** . . . W. J. Reichard, 856 Penobscot Bldg., Woodward 2-1793

**Los Angeles 17** . . . Robert Obenour, 1125 West Sixth St., Huntley 2-5450

**New York 36** . . . D. G. Sawyer, Paul F. Cowie, 500 Fifth Ave., Oxford 5-5959

**Philadelphia 3** . . . J. P. Tiebout, 6 Penn Center Plaza, Locust 8-4330

**Pittsburgh 22** . . . K. Reeves Cook, 1111 Oliver Bldg., Express 1-1314

**St. Louis 8** . . . Bayard Nicholas, 3615 Olive St., Continental Bldg., Jefferson 5-4867

**San Francisco 4** . . . R. C. Alcorn, 68 Post St., Douglas 2-4600

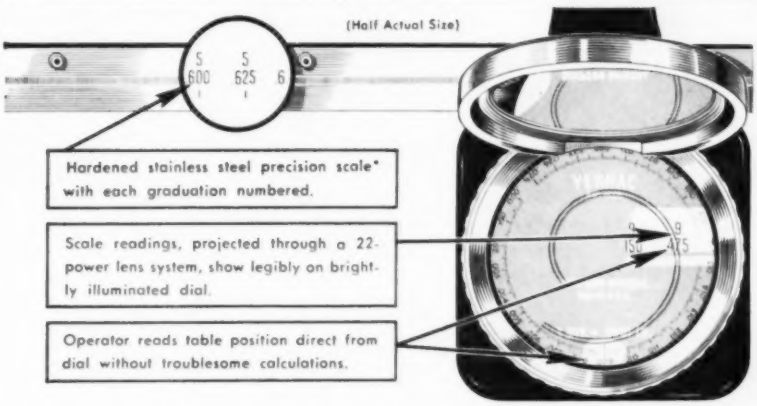
**Europe** . . . E. E. Schirmer, McGraw-Hill House, 95 Farringdon St., London E.C. 4
**Michael R. Zeynal, 85, Westendstrasse, Frankfurt/Main, Germany**



# BIG CROWD

When a production man needs something—equipment, accessories, materials or supplies—he usually wants it in a hurry. The best place to find out "where to buy it" for Metalworking is the American Machinist Buyers' Guide.

The 1960 Buyers' Guide Issue of American Machinist—to be published in September, 1959—will include the biggest list of product sources ever. Over 3,400 manufacturers will list their products under 1,800 different headings. Meanwhile, when you need something refer to your 1959 Buyers' Guide. It's a tremendously valuable source.


(Half Actual Size)
Hardened stainless steel precision scale* with each graduation numbered.
Scale readings, projected through a 22-power lens system, show legibly on brightly illuminated dial.
Operator reads table position direct from dial without troublesome calculations.

New optical measuring instrument assures . . .

## high operating accuracy for new or used machine tools

The new VERNAC Direct Reading Optical Measuring Instrument eliminates the complexities of using end rods and gage blocks. Now, the longitudinal, lateral or vertical positioning of machine tool tables can be quickly and easily read direct to .0001". Accuracy is not affected by the wear or stretch of table movement screws. The instrument itself has no moving parts which can impair accuracy.

VERNAC instruments also up-grade machine tools to perform tasks beyond their original accuracy. For example, they can up-grade moderately priced milling machines to the accuracy of more expensive jig boring machines at a fraction of the latter's cost.

*The scale is a replica of a master certified by the U.S. National Bureau of Standards to .0001" maximum error over its entire length.

**SEND FOR FREE BULLETIN.** Explains how the VERNAC enables you to do more precise work on your present machine tools.

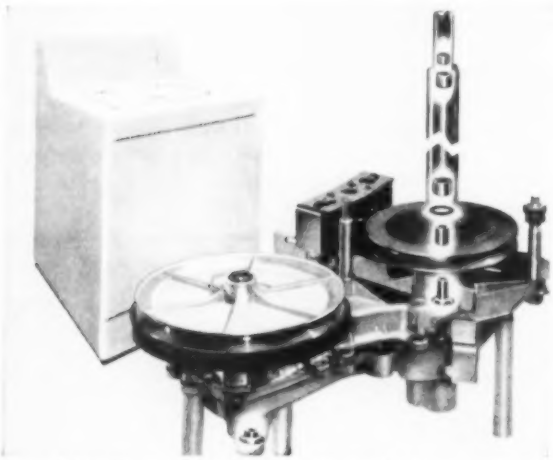
**VERNAC®** UNITED STATES AND FOREIGN PATENTS PENDING

*Designed and Manufactured by*
**SIMPSON OPTICAL MANUFACTURING CO.**
**3202-06 Carroll Ave., Chicago 24, Ill.**

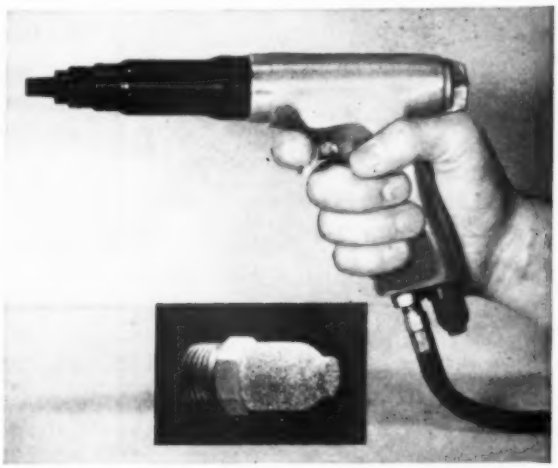
Manufacturers and designers of precision optics for scientific equipment since 1926.

Simpson Optical Manufacturing Company, 3202-06 Carroll Ave., Chicago 24
Send me free literature describing the VERNAC Optical Measuring Instrument.
Name
Company
Street Address City Zone State

# BOOST PRODUCT APPEAL with OILITE

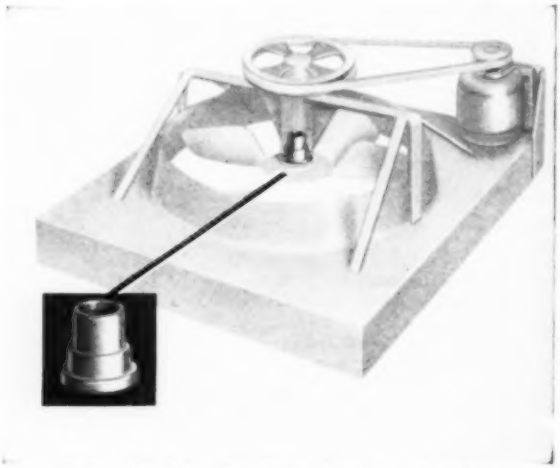


This "best seller" automatic washer is more reliable, more economical with Oilite oil-cushioned bearings.



Oilite filter-diffusers are now boosting the sale of new air tools by making them practically "noiseless".

Dust, grit, shocks — plus payloads up to 31 tons — are all in a day's work for these tough Oilite bearings.



This self-lubricating Oilite bearing refused to fail even after 125 years' service in accelerated life tests.

***Quality-built OILITE*®*** bearings, parts and filters help sell many products by improving performance and keeping costs down. Mass-produced at Amplex's 2 modern plants, even the most intricate parts are die-pressed directly into ready-to-use, close tolerance shapes. Amplex engineering, research and production know-how can probably help you. Why not contact your Oilite representative today? Look for him in the Yellow Pages under "bearings—Oilite" or write Dept. I-5.

** Only Chrysler Makes Oilite*

PM PM MEMBER SINCE 1929

A CHRYSLER OILITE PRODUCT

*the most trusted name in powder metallurgy!*

**AMPLEX DIVISION**

CHRYSLER CORPORATION, DETROIT 31, MICHIGAN

SELF-LUBRICATING BEARINGS • PRECISION PARTS • METAL FILTERS • FRICTION UNITS

more

# metalworking facts

free

from

# American Machinist

*These handy, prepaid cards will bring you more data on:*

- **PRODUCTS ADVERTISED**
- **NEW EQUIPMENT DESCRIBED**

*also*

- **COPIES OF CATALOGS OFFERED**

*now*

**EVERY ADVERTISEMENT,* NEW EQUIPMENT ITEM, AND CATALOG OFFERED IN THIS ISSUE IS NUMBERED**

* *A few advertisements cannot be keyed and must be indicated by writing the Advertiser's name at the bottom of the card.*

• *for full details on how to use these cards, see reverse side . . .*

First Class Permit No. 64 (Sec. 34.9 P.L.&R.) New York, N. Y.

**BUSINESS REPLY CARD**

No Postage Stamp necessary if mailed in the United States

Postage will be paid by—

**American Machinist**

330 West 42nd Street

New York 36, N. Y.

Reader Service Dept.

5/18/59

*This card expires 7/18/59*

First Class Permit No. 64 (Sec. 34.9 P.L.&R.) New York, N. Y.

**BUSINESS REPLY CARD**

No Postage Stamp necessary if mailed in the United States

Postage will be paid by—

**American Machinist**

330 West 42nd Street

New York 36, N. Y.

Reader Service Dept.

5/18/59

*This card expires 7/18/59*

(These are KEY numbers, not page numbers)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23 | 45 | 67 | 89 | 111 | 133 | 155 | 177 | 199 | 221 | 243 | 265 | 287 | 309 | 331 | 353 | 375 | 397 | 419 | 441 |
| 2 | 24 | 46 | 68 | 90 | 112 | 134 | 156 | 178 | 200 | 222 | 244 | 266 | 288 | 310 | 332 | 354 | 376 | 398 | 420 | 442 |
| 3 | 25 | 47 | 69 | 91 | 113 | 135 | 157 | 179 | 201 | 223 | 245 | 267 | 289 | 311 | 333 | 355 | 377 | 399 | 421 | 443 |
| 4 | 26 | 48 | 70 | 92 | 114 | 136 | 158 | 180 | 202 | 224 | 246 | 268 | 290 | 312 | 334 | 356 | 378 | 400 | 422 | 444 |
| 5 | 27 | 49 | 71 | 93 | 115 | 137 | 159 | 181 | 203 | 225 | 247 | 269 | 291 | 313 | 335 | 357 | 379 | 401 | 423 | 445 |
| 6 | 28 | 50 | 72 | 94 | 116 | 138 | 160 | 182 | 204 | 226 | 248 | 270 | 292 | 314 | 336 | 358 | 380 | 402 | 424 | 446 |
| 7 | 29 | 51 | 73 | 95 | 117 | 139 | 161 | 183 | 205 | 227 | 249 | 271 | 293 | 315 | 337 | 359 | 381 | 403 | 425 | 447 |
| 8 | 30 | 52 | 74 | 96 | 118 | 140 | 162 | 184 | 206 | 228 | 250 | 272 | 294 | 316 | 338 | 360 | 382 | 404 | 426 | 448 |
| 9 | 31 | 53 | 75 | 97 | 119 | 141 | 163 | 185 | 207 | 229 | 251 | 273 | 295 | 317 | 339 | 361 | 383 | 405 | 427 | 449 |
| 10 | 32 | 54 | 76 | 98 | 120 | 142 | 164 | 186 | 208 | 230 | 252 | 274 | 296 | 318 | 340 | 362 | 384 | 406 | 428 | 450 |
| 11 | 33 | 55 | 77 | 99 | 121 | 143 | 165 | 187 | 209 | 231 | 253 | 275 | 297 | 319 | 341 | 363 | 385 | 407 | 429 | 451 |
| 12 | 34 | 56 | 78 | 100 | 122 | 144 | 166 | 188 | 210 | 232 | 254 | 276 | 298 | 320 | 342 | 364 | 386 | 408 | 430 | 452 |
| 13 | 35 | 57 | 79 | 101 | 123 | 145 | 167 | 189 | 211 | 233 | 255 | 277 | 299 | 321 | 343 | 365 | 387 | 409 | 431 | 453 |
| 14 | 36 | 58 | 80 | 102 | 124 | 146 | 168 | 190 | 212 | 234 | 256 | 278 | 300 | 322 | 344 | 366 | 388 | 410 | 432 | 454 |
| 15 | 37 | 59 | 81 | 103 | 125 | 147 | 169 | 191 | 213 | 235 | 257 | 279 | 301 | 323 | 345 | 367 | 389 | 411 | 433 | 455 |
| 16 | 38 | 60 | 82 | 104 | 126 | 148 | 170 | 192 | 214 | 236 | 258 | 280 | 302 | 324 | 346 | 368 | 390 | 412 | 434 | 456 |
| 17 | 39 | 61 | 83 | 105 | 127 | 149 | 171 | 193 | 215 | 237 | 259 | 281 | 303 | 325 | 347 | 369 | 391 | 413 | 435 | 457 |
| 18 | 40 | 62 | 84 | 106 | 128 | 150 | 172 | 194 | 216 | 238 | 260 | 282 | 304 | 326 | 348 | 370 | 392 | 414 | 436 | 458 |
| 19 | 41 | 63 | 85 | 107 | 129 | 151 | 173 | 195 | 217 | 239 | 261 | 283 | 305 | 327 | 349 | 371 | 393 | 415 | 437 | 459 |
| 20 | 42 | 64 | 86 | 108 | 130 | 152 | 174 | 196 | 218 | 240 | 262 | 284 | 306 | 328 | 350 | 372 | 394 | 416 | 438 | 460 |
| 21 | 43 | 65 | 87 | 109 | 131 | 153 | 175 | 197 | 219 | 241 | 263 | 285 | 307 | 329 | 351 | 373 | 395 | 417 | 439 | 461 |
| 22 | 44 | 66 | 88 | 110 | 132 | 154 | 176 | 198 | 220 | 242 | 264 | 286 | 308 | 330 | 352 | 374 | 396 | 418 | 440 | 462 |

INSIDE FRONT COVER — INSIDE BACK COVER — BACK COVER

UNKEYED AD

Name

Title

Company Name

Address

City, State

**SEARCHLIGHT SECTION**

| Samples | Used and Rebuilt Equipment | | |
|---|---|---|---|
| 500 | 507 | 514 | 521 | 528 |
| 501 | 508 | 515 | 522 | 529 |
| 502 | 509 | 516 | 523 | 530 |
| 503 | 510 | 517 | 524 | 531 |
| 504 | 511 | 518 | 525 | 532 |
| 505 | 512 | 519 | 526 | 533 |
| 506 | 513 | 520 | 527 | 534 |

(These are KEY numbers, not page numbers)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23 | 45 | 67 | 89 | 111 | 133 | 155 | 177 | 199 | 221 | 243 | 265 | 287 | 309 | 331 | 353 | 375 | 397 | 419 | 441 |
| 2 | 24 | 46 | 68 | 90 | 112 | 134 | 156 | 178 | 200 | 222 | 244 | 266 | 288 | 310 | 332 | 354 | 376 | 398 | 420 | 442 |
| 3 | 25 | 47 | 69 | 91 | 113 | 135 | 157 | 179 | 201 | 223 | 245 | 267 | 289 | 311 | 333 | 355 | 377 | 399 | 421 | 443 |
| 4 | 26 | 48 | 70 | 92 | 114 | 136 | 158 | 180 | 202 | 224 | 246 | 268 | 290 | 312 | 334 | 356 | 378 | 400 | 422 | 444 |
| 5 | 27 | 49 | 71 | 93 | 115 | 137 | 159 | 181 | 203 | 225 | 247 | 269 | 291 | 313 | 335 | 357 | 379 | 401 | 423 | 445 |
| 6 | 28 | 50 | 72 | 94 | 116 | 138 | 160 | 182 | 204 | 226 | 248 | 270 | 292 | 314 | 336 | 358 | 380 | 402 | 424 | 446 |
| 7 | 29 | 51 | 73 | 95 | 117 | 139 | 161 | 183 | 205 | 227 | 249 | 271 | 293 | 315 | 337 | 359 | 381 | 403 | 425 | 447 |
| 8 | 30 | 52 | 74 | 96 | 118 | 140 | 162 | 184 | 206 | 228 | 250 | 272 | 294 | 316 | 338 | 360 | 382 | 404 | 426 | 448 |
| 9 | 31 | 53 | 75 | 97 | 119 | 141 | 163 | 185 | 207 | 229 | 251 | 273 | 295 | 317 | 339 | 361 | 383 | 405 | 427 | 449 |
| 10 | 32 | 54 | 76 | 98 | 120 | 142 | 164 | 186 | 208 | 230 | 252 | 274 | 296 | 318 | 340 | 362 | 384 | 406 | 428 | 450 |
| 11 | 33 | 55 | 77 | 99 | 121 | 143 | 165 | 187 | 209 | 231 | 253 | 275 | 297 | 319 | 341 | 363 | 385 | 407 | 429 | 451 |
| 12 | 34 | 56 | 78 | 100 | 122 | 144 | 166 | 188 | 210 | 232 | 254 | 276 | 298 | 320 | 342 | 364 | 386 | 408 | 430 | 452 |
| 13 | 35 | 57 | 79 | 101 | 123 | 145 | 167 | 189 | 211 | 233 | 255 | 277 | 299 | 321 | 343 | 365 | 387 | 409 | 431 | 453 |
| 14 | 36 | 58 | 80 | 102 | 124 | 146 | 168 | 190 | 212 | 234 | 256 | 278 | 300 | 322 | 344 | 366 | 388 | 410 | 432 | 454 |
| 15 | 37 | 59 | 81 | 103 | 125 | 147 | 169 | 191 | 213 | 235 | 257 | 279 | 301 | 323 | 345 | 367 | 389 | 411 | 433 | 455 |
| 16 | 38 | 60 | 82 | 104 | 126 | 148 | 170 | 192 | 214 | 236 | 258 | 280 | 302 | 324 | 346 | 368 | 390 | 412 | 434 | 456 |
| 17 | 39 | 61 | 83 | 105 | 127 | 149 | 171 | 193 | 215 | 237 | 259 | 281 | 303 | 325 | 347 | 369 | 391 | 413 | 435 | 457 |
| 18 | 40 | 62 | 84 | 106 | 128 | 150 | 172 | 194 | 216 | 238 | 260 | 282 | 304 | 326 | 348 | 370 | 392 | 414 | 436 | 458 |
| 19 | 41 | 63 | 85 | 107 | 129 | 151 | 173 | 195 | 217 | 239 | 261 | 283 | 305 | 327 | 349 | 371 | 393 | 415 | 437 | 459 |
| 20 | 42 | 64 | 86 | 108 | 130 | 152 | 174 | 196 | 218 | 240 | 262 | 284 | 306 | 328 | 350 | 372 | 394 | 416 | 438 | 460 |
| 21 | 43 | 65 | 87 | 109 | 131 | 153 | 175 | 197 | 219 | 241 | 263 | 285 | 307 | 329 | 351 | 373 | 395 | 417 | 439 | 461 |
| 22 | 44 | 66 | 88 | 110 | 132 | 154 | 176 | 198 | 220 | 242 | 264 | 286 | 308 | 330 | 352 | 374 | 396 | 418 | 440 | 462 |

INSIDE FRONT COVER — INSIDE BACK COVER — BACK COVER

UNKEYED AD

Name

Title

Company Name

Address

City, State

**SEARCHLIGHT SECTION**

| Samples | Used and Rebuilt Equipment | | |
|---|---|---|---|
| 500 | 507 | 514 | 521 | 528 |
| 501 | 508 | 515 | 522 | 529 |
| 502 | 509 | 516 | 523 | 530 |
| 503 | 510 | 517 | 524 | 531 |
| 504 | 511 | 518 | 525 | 532 |
| 505 | 512 | 519 | 526 | 533 |
| 506 | 513 | 520 | 527 | 534 |

# more data?

# it's easy

*1. Circle Key Number(s)*
on these cards that correspond(s) to number(s) at bottom of advertisement(s), new equipment item(s) or catalog(s) offered

2. Print clearly . . .
*name, title, company name and address*

*3. Tear Off and Mail . . .*
We'll do the rest

*Use these time-saving cards to keep up-to-date with the metalworking industry*

# This Catalog is a 68 Page Handbook on Drills and Drilling Information

See your Cogsdill Distributor
or send the coupon

**24 PAGES** of Cogsdill's complete drill line

**44 PAGES** of Engineering data, including drilling of "hot" metals

**COGSDILL TWIST DRILL CO., INC.**
**Greenfield, Mass.**

Please send me a copy of your new Cogsdill Drill Catalog and name of nearest Cogsdill Distributor.

Name _____

Position _____

Company _____

Address _____

_____

# 3 new applications get longer life and minimum maintenance using Dodge pillow blocks with Timken® bearings

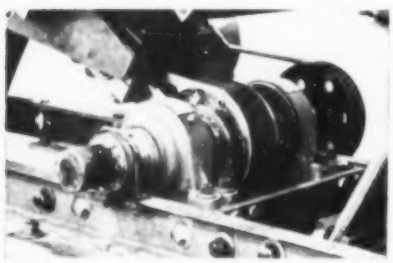
PICTURED below are three applications where Timken bearing equipped Dodge pillow blocks stay on the job with little attention under tough conditions. Their tapered design lets Timken® bearings take *both* radial and thrust loads in any combination. And full-line contact between rollers and races provides extra load-carrying capacity. Wear is reduced, maintenance is cut to the minimum.

Cutaway view shows the Dodge All-Steel pillow block with Timken bearing mounting. Of special design, the bearing has a tapered bore with self-aligning spherical outer surface —never needs adjustment.

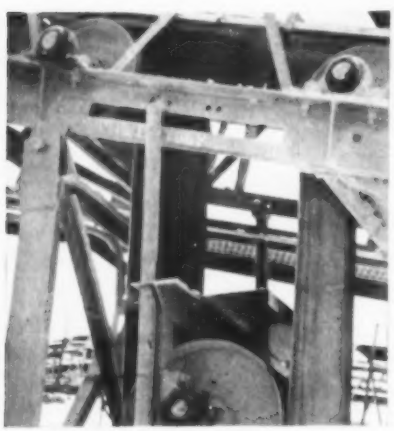
Besides the All-Steel pillow block, other versatile Dodge pillow blocks with Timken tapered roller bearings are: Type "E", Double-Interlock, Type "C" and Special Duty. All are compact in design. Special thrust devices that take up extra space are not needed.

And to get the finest steel for Timken bearings, we make it ourselves—America's only bearing manufacturer that does. So specify bearings trademarked "TIMKEN" for the machines you buy or build. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

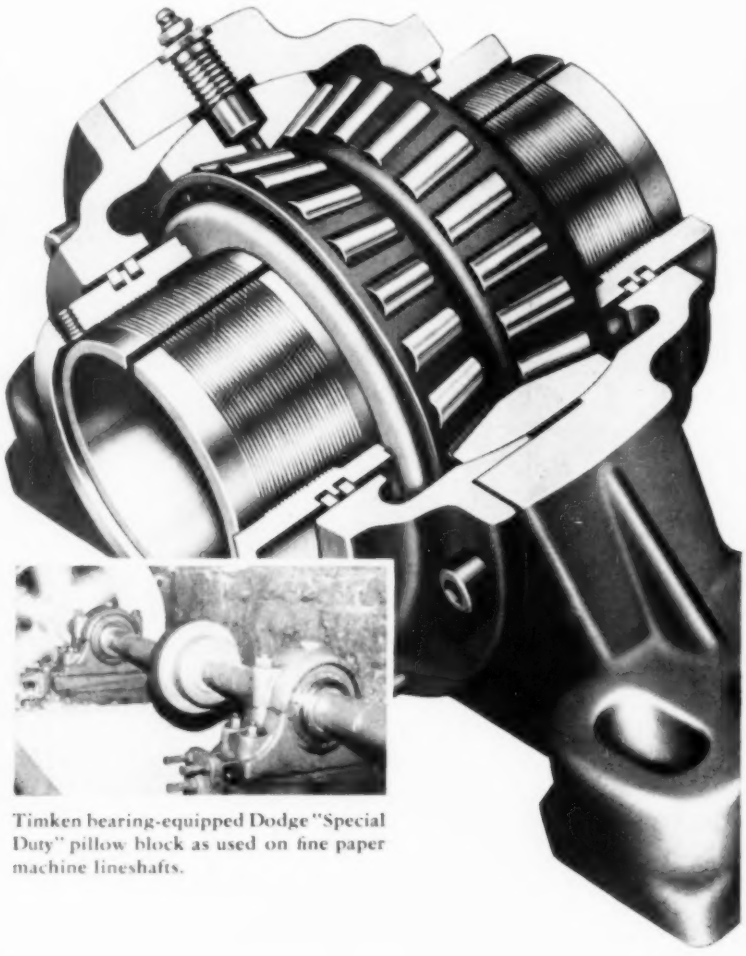
*This symbol on a product means its bearings are the best.*



Timken bearing-equipped Dodge All-Steel pillow block used in a vibrating conveyor.



Timken bearing-equipped Dodge Type "E" pillow block used in sand and gravel plant.



Timken bearing-equipped Dodge "Special Duty" pillow block as used on fine paper machine lineshafts.

TIMKEN

TAPERED ROLLER BEARINGS ROLL THE LOAD